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FINAL REPORT

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Prepared for:

Defense Civil Preparedness Agency
Washington, D.C. 20301

Contract: DCPA01-75-C-0279
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May 1977

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Center for Planning and Research, Inc.

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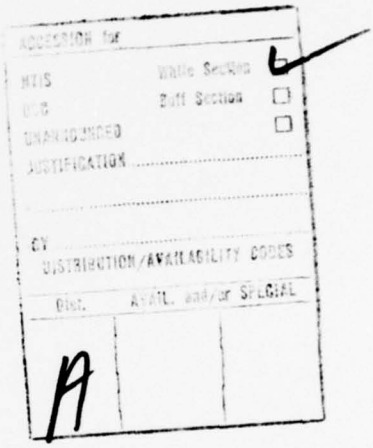
by

Richard K. Laurino
Frank Trinkl
Carl F. Miller
Robert A. Harker



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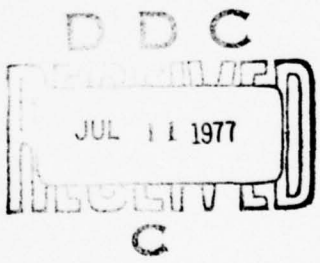

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Economic and industrial problems related to crisis relocation are identified and described. Problems faced by the individual, private business, financial system, and local and regional government are presented in terms of operational phases beginning with Pre-relocation crisis period, crisis relocation initiation, relocation maintenance period, and the CR-reconstitution period.

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Approaches for estimating national economic impact of the crisis relocation are developed. Planning methods for identifying types of essential industry and key workers are outlined. Input-output analysis methods are described for determining levels of production required by various essential industry sectors at the national and regional levels.

EXECUTIVE SUMMARY

Background and Objectives

Among the various defense options being developed by the Defense Civil Preparedness Agency is the option of crisis relocation (CR). An important consideration in crisis relocation planning (CRP) is the economic impact of the proposed actions. Effective planning must therefore include the identification, definition, and control of economic effects on individual economic units and on the overall economic system. A related problem is the identification and preparation of industry for production of goods and services deemed essential during crisis relocation. This study is an initial effort to systematically examine these subject areas. Included in the study are a structuring of the basic economic problems, and the development of a rationale and procedures for selection of essential industry and supporting elements.

Basic Concepts

A number of basic crisis relocation concepts would have a strong impact upon the nature and extent of economic problems and the design of proposed economic control measures. These concepts include:

- o Continuity of the economic system - Maintenance of the basic structure of the economic system during crisis relocation is essential for the credibility, effectiveness, and efficiency of CR operations and for rapid restoration of the economy thereafter.
- o Phasing of Economic Measures - Economic and other actions should be invoked early enough to affect the problems they are designed to control. With respect to the economy, this consideration would require initiation of a graduated set of economic measures prior to the start of crisis relocation.
- o Duration of the relocation period - While a period of two weeks is often assumed to be a reasonable length for relocation, the possible length of the period is actually indeterminate. The credibility of the system might depend on a perceived ability to maintain the relocation posture for a period longer than two weeks.
- o Reconstitution of the economy - Losses sustained during the crisis would continue to affect the economic system for months or years thereafter. To avoid significant additional post-crisis losses, prompt government assistance to many sectors of the economy would be required.

- o Balanced planning - A balanced crisis relocation system must perform effectively, whether the outcome is peace or war. With respect to the economy, measures must allow efficient functioning during the crisis and either a rapid economic restoration if the crisis is resolved, or the independent functioning and subsequent recovery activity by non-risk areas if the crisis results in nuclear war.

- o Consideration of government roles - Many government agencies have assigned roles and traditional approaches in event of war, natural disaster, or other national emergencies. While not specifically designed for crisis relocation, these roles and approaches provide the starting point for the development of economic assistance and other roles of government in CR.

Definitional Structure

The systematic investigation of crisis relocation economic problems should start with a definitional structure that classifies problems into manageable groups. For this purpose, a structure has been defined in terms of the following categories: the type of economic unit involved; the economic, geographical, or administrative area in which the problem occurs; the time of occurence of the problem with respect to the crisis; and the role of the economic unit during the specified time period. A minimum set of descriptors would be:

- o Organizational elements include the individual or family, private business, financial institutions, state and local governments, and federal government.

- o Location defines the area of influence of the problem in terms of risk or host area, region, state, or nation.

- o Operational phase divides the time stream into segments distinguished by changing problems or objectives. Included are the Pre-CR Crisis, CR-Initiation, CR-Maintenance, and CR-Reconstitution Phases.

- o Activity indicates the role of the economic unit during any operational phase, including distinctions such as essential producer, non-essential producer, non-producer (welfare), and non-producer (investment income).

Specific Economic Impact of Crisis Relocation

For each organizational element, location, operational phase, and activity classification, a different set of economic problems can be identified. The individual (or family) would face the basic difficulty of making necessary purchases and meeting prior obligations in the presence of economic disruptions that might curtail income, credit, and access to

liquid assets. These problems might begin to arise in the Pre-CR Crisis Phase and continue well after the crisis was resolved. As the danger in the crisis became a reality, absenteeism and unemployment could reduce individual income at a time when shortages and price rises for essential goods and services began to occur. During the CR-Initiation and CR-Maintenance Phases, many individuals would not have the financial resources necessary to make essential purchases or pay obligations and might not be able to find needed goods and services due to developing shortages. Under traditional approaches, government assistance would be provided at no cost to evacuees and others for essentials such as food, shelter, clothing, and medical treatment.

During the CR-Reconstitution Phase, a significant fraction of individuals would be unable to meet accumulated obligations. This fraction would include about one-third of all families which normally have essentially no liquid assets, and another large fraction which would have depleted their liquid assets during the crisis. The problem would be of such a scale that prompt government financial assistance to all needy individuals would be required immediately after relaxation of the crisis relocation posture in order to assure equity and a rapid resumption of industrial activity.

Private business would experience disruptions early in the Pre-CR Crisis Phase because of such factors as changes in demand patterns, and absenteeism of employees. Further disruption in business conditions might be caused by employers' protective actions, such as efforts to increase liquidity and cash in hand by sale of inventories, reduced orders or production rates, non-payment of obligations, reduction in staff, withdrawal of demand deposits, etc. These conditions could be ameliorated to some degree by prompt government institution of emergency control measures. CR-Initiation would bring a temporary shutdown of most businesses, followed by a resumption of the activity of essential industry in host and risk areas, and of most business in non-risk areas. The time required to resume essential industrial activity would depend upon the adequacy of individual planning by industries, and of crisis relocation planning in general. During the

CR-Reconstitution Phase, business would continue to be hampered by slow receipt of payments, reduced liquid assets and credit, delays in replacement of inventories, changes in demand, and other factors. Without prompt financial assistance, many businesses, especially small business, would be in danger of bankruptcy. Such an increase in the rate of bankruptcy would affect the financial condition of many larger businesses through losses of accounts receivable and through reduced demand.

Financial institutions include all financial intermediaries that facilitate the flow of funds -- commercial banks, trust companies, private banks, savings banks, mutual savings banks, credit unions, postal depositories, and financial regulatory agencies such as the Federal Reserve System. The institutions form an interrelated system that is easily disturbed by anticipated events such as a crisis.

The level of normal services provided by financial institutions might decrease significantly in the Pre-CR Crisis Phase and continue at a reduced level throughout the crisis and afterward. Pressure on demand, time, and savings deposits, lower availability of interbank loans, slowdown in receipts on loans, mortgages etc., and decrease in the value of securities and investment -- all would tend to reduce bank reserves, and would require prompt and effective actions by bank regulatory agencies. The ability to make new loan commitments would be curtailed. Functioning banks in host areas would experience an increase in activities such as demands on vault cash, check clearing, and other interbank transfers. Since almost all transactions are completed by bank transfers, it would be necessary to maintain the check clearing system for this purpose: At least those money market banks and Federal Reserve banks in major risk areas should be functioning during the CR-Maintenance Phase. Lags in the buildup of demand, time, and savings deposits after the crisis would further restrict the ability of financial institutions to provide funds for the credit markets. New loan commitments would have to be selective.

Because of the significant holdings of public and private sector securities by financial institutions, any major series of bankruptcies after crisis relocation relaxation could also jeopardize the financial condition of many banks.

State and risk area governments would experience a significant decrease in revenue, during the CR-Maintenance Phase, from sources such as sales and gross receipts tax, licenses, income taxes, and revenue from services normally provided to inhabitants. In risk areas, revenue districts dependent upon service revenues would be particularly vulnerable. Other types of local and state income might, however, continue to accrue, including property taxes and intergovernmental revenue, but collection would be delayed. While income would decrease for risk area governments, expenditures might decrease only slightly or actually increase. Presumably, costs would continue for some salaries, supplies, maintenance and depreciation, debt service, etc. Both revenue and costs could be higher for host area governments because of the presence of evacuees and emergency activities.

The ability of state and local governments to withstand the impact of crisis relocation would depend upon the underlying soundness of their financial structure, the availability of additional revenue and cost controls in the Post-CR Phase, and their ability to control cost. Most state and local governments are sufficiently sound to withstand the losses associated with crisis relocation. However, states and localities (such as industrial areas in the Northeast United States) that are currently in or near financial trouble might be placed in serious jeopardy by crisis relocation losses and these agencies would probably require additional prompt federal government assistance.

Selection of Essential Industry

The types, levels, and locations of industrial activity needed during the CR-Maintenance Phase are derived from national objectives. Major objectives would include support of:

(1) Crisis relocation effort

(2) Postattack recovery preparations

(3) Present and planned military operations.

Requirements or demands generated by the CR objectives would include the provision of life support goods and services (e.g., food, shelter, public health), and support for non-risk area economies and essential industry (e.g., financial services, transportation, utilities). The postattack recovery objective would generate requirements for the buildup of industrial and organizational resources in non-risk areas to permit

independent operation of non-risk areas for an extended period and to provide a capability to recover areas damaged by attack. The military support objective could create demands ranging from use of current stocks to the high level of production associated with a mobilization effort.

Successful functioning of essential industry during the CR-Maintenance Phase would depend heavily upon the planning done prior to the crisis. Such planning would require participation of national, regional, and local governments as well as private industry. The basic sequence of planning steps required is as follows:

- o Define national objectives and demands - Define specific national objectives and derive therefrom national and per-capita demands for goods and services appropriate to emergency conditions.
- o Generate industrial activity requirements - Use the statement of demands together with a basic production model (input-output model) to generate requirements for reduced levels of industrial activity at national and regional levels.
- o Determine capacity to meet industrial activity requirements - Using available data on industrial capacity, compare requirements with actual capacity in various regions and non-risk areas. Determine deficits in non-risk area production and inventories, and make initial estimates of essential risk area production.
- o Conduct local and regional planning - Using national estimates for required risk and non-risk area production, undertake verification and specific facility identification including inventories of essential goods. Produce regional plans including new estimates of capacities and interregional demands. Estimate type and number of key workers for selected facilities.
- o Reconciliation of regional plans - At the national level, review regional plans and allocate interregional capacities to meet regional deficits. Review national objectives and demands, and adjust national guidance for regional plans as required.
- o Finalization of regional plans - Local and state planners revise regional plans as directed. Make final selection of production facilities and key workers, and assist those facilities in initiating crisis production plans.

Economic Impact Following Crisis

A key element in successful economic planning would be aimed at preventing undue economic disruption in the months or years following resolution of the crisis. Adverse economic impact during the crisis could amount to tens of billions of dollars. This impact, while large, could be absorbed by the economy if effective measures were taken to prevent

amplification of this impact in the post-crisis period. Such measures would aim at assuring that economic sectors and units had the necessary financial resources to resume pre-crisis activities, and that undue losses to specific sectors and groups were ameliorated.

Econometric Model

A planning process has been developed in this study to estimate the general dimensions of economic impact and the relative value of various government policies in alleviating or preventing these impacts. Using national statistics, initial impacts can be determined for each economic unit in any given crisis scenario. A small prototype econometric model has been devised to use these initial estimates in generating approximate effects on major national indicators over time (e.g., gross national product, interest rates, gross investment, demand for and availability of credit, GNP gap, disposable income, and government budget surplus). Model relationships were validated by multiple regression techniques using national annual data for a 20-year period.

Recommended Planning and Research Efforts

The magnitude and variety of economic effects of crisis relocation under a variety of possible scenarios emphasize the need for examining alternative economic readiness measures. To achieve an acceptable level of readiness, specification is required of a series of practical planning and research efforts that can be undertaken in parallel with other CRP efforts. Important economic/industrial research and planning areas needing priority attention include the following:

- o Economic stabilization and control during crisis - This effort would require the detailed and quantitative examination of specific problems in crisis, including stabilization and control of crisis economic reactions of the private sectors that are detrimental to the economy (e.g., excessive demand, undue speculation, price increases). The effort would also consider control of economic exchanges of residents and evacuees in the host areas, resources and procedures for host and risk area bank operation in the CR-Maintenance Phase, and other specific problems.
- o Post-crisis economic assistance to the private, non-financial sectors - This effort would include the determination of specific direct and indirect government assistance needed, such as cash payments, loans, and guarantees to individuals and private business. This effort would also identify and evaluate specific measures to provide for the rapid reconstitution of individual economic units and of business in general, with specific attention to those units that are particularly vulnerable.

- Impact of CR economic policies on the national economy - This effort would include the quantitative determination of aggregate losses associated with crisis and its aftermath, in terms of national economic indicators such as gross national product, disposable income, interest rates, and budget deficits. Economic policies formulated with the assistance of cognizant agencies would be used to estimate initial costs and other economic effects in the early CR-Reconstitution Phase. The impact of these initial conditions and assumed continuing policies would be examined using the econometric model developed in this current project. Relative performance of alternative economic policies would be determined and superior policy options would be identified.

- Required government regulatory actions and intergovernmental relationships - This effort would entail a review of traditional emergency economic responsibilities of local, state, and federal governments for the purpose of identifying and analyzing needed changes to meet new conditions posed by crisis relocation and its aftermath. Particular emphasis would be directed toward identifying and quantifying the additional federal financial assistance needed by local and state governments during and after crisis relocation.

- Essential industry requirements - This effort would include development of the procedures and national level estimates of essential industry requirements based on specified national objectives. National level estimates together with regional information would be applied to a regional area to determine surplus and deficit industrial capacities, and to provide initial estimates of required risk area production or interregional supply requirements. Key worker requirements would also be determined for each risk area in the region.

- Development of essential industry planning system - This effort would include the further development of all steps of the proposed essential industry planning system, including national and regional planning procedures. Initial testing of the planning procedure would be undertaken for a given regional area. Data and other planning requirements for full implementation would be developed.

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ACKNOWLEDGMENTS

This study effort has drawn heavily upon the studies, experience, and background of both government and private groups in the field of emergency planning. In the areas of economic and financial policy, we are particularly indebted to Joseph Russo of the Federal Preparedness Agency and Gordon Grimwood of the Federal Reserve Board. The study effort also benefited significantly from ongoing research and planning work in the Defense Civil Preparedness Agency. Specific acknowledgement is made of the technical and administrative assistance provided by James Kerr, Staff Director of Support Systems Research, and George Divine, DCPA staff economist. Considerable assistance relating to crisis relocation planning was provided by William Chipman, Deputy Assistant Director for Plans; Seymour Wengrovitz, Staff Director, Plans and Systems Development Division; and Hanford Edsall, Research System Development Specialist.

I. INTRODUCTION

Background

The Defense Civil Preparedness Agency has been engaged in extensive study and planning related to the crisis relocation (CR) option. This option would be designed for use during a period of deep international crisis to move population from areas considered to be in danger of nuclear attack (risk areas) into surrounding regions (host areas) where the chances of survival could be much better. Nationwide crisis relocation might require evacuation of as many as 400 risk areas encompassing urban areas and other areas surrounding important military targets.[1]

The rationale for the option is that a significant period of crisis could precede any strategic attack on the United States and that the Soviet Union might make use of this period to relocate a significant part of its population. Many credible scenarios have been suggested for these events such as in the DCPA report by Brown.[2] Generally these scenarios assume a buildup of crisis intensity over a period of days, weeks, or months culminating in the use of crisis relocation by the Soviet Union followed shortly thereafter by the relocation of U.S. population. The period of time that the relocation posture is maintained has been estimated to be as short as one week. The maximum duration of the relocation period is uncertain but is often assumed to be two weeks with the possibility of a longer relocation period of several weeks. The usual assumption is that the crisis ends in a peaceful solution although the possibility of attack cannot be disregarded in planning.

From the economic viewpoint, a scenario can be considered in terms of a crisis profile (Figure 1) measured by the degree of economic disruption over a period of time encompassing the international crisis. The intensity of the resulting economic emergency could be measured by many economic indicators such as unemployment rate, GNP loss, etc. Such economic disruption could begin well before the actual use of CR and might persist for a considerable period after the resolution of the dispute.

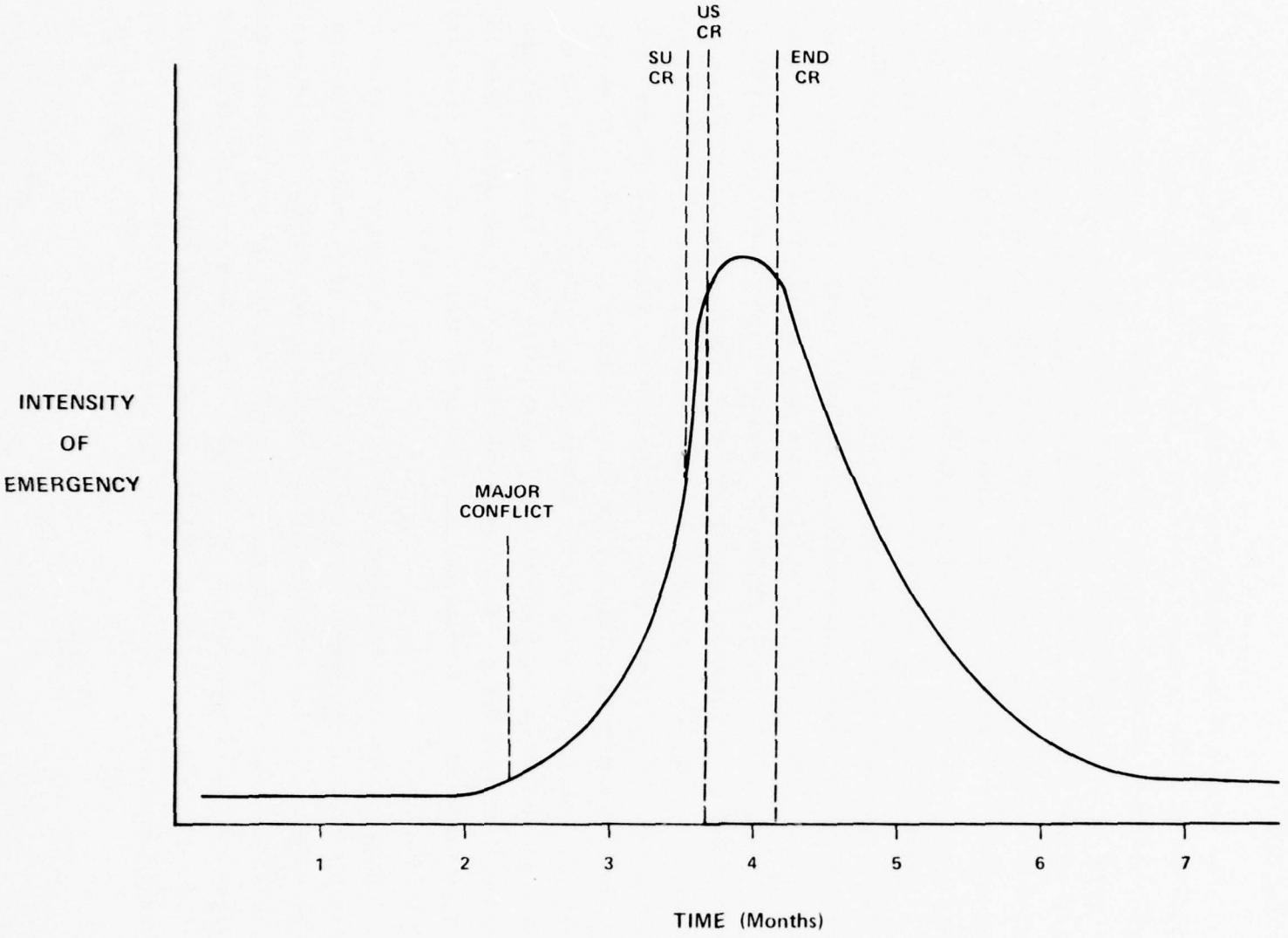

FIGURE 1

SAMPLE CRISIS PROFILE

The principal economic problems can be characterized as: (1) the determination of economic problems arising for individual economic units and the national economy as a result of crisis relocation, and (2) the identification of, and planning for, essential industrial activity during crisis relocation.

National policy makers should therefore be concerned with problems such as losses of income to risk area workers, businesses, financial institutions, and governments; added costs and problems associated with maintaining evacuees in host areas; disruption of functioning of remaining active businesses and financial institutions; a host of operational problems for those individuals and groups attempting to transact business in a crisis environment; and many other problems. In the event that the crisis were resolved without an attack, the losses sustained during the relocation period would continue to have an impact, possibly causing additional significant losses and slowing the recovery of economic activity.

Because of the concentration and importance of industry in urbanized areas, it has also been recognized that some essential industrial activity in risk areas would be needed during the relocation period. It is therefore necessary to identify essential industry and associated resources, and to develop quantitative approaches for designation of industrial activity requirements in specific risk and non-risk areas.

The study of emergency economic and industrial measures is an integral part of the development of a credible crisis relocation option. Such study efforts lead to the planning, training, organizational, and legal activities needed to achieve economic readiness. The results of this study also provide feedback of information into other CRP efforts so as to achieve a better balance between economic and operational considerations.

Objectives of Study

This study represents the initial phase of a continuing inquiry into the economic problems resulting from crisis relocation. The objectives of this phase I study are given in the following task statement:

> Analyze the impact of planning for, carrying out, maintaining, and revoking the crisis relocation of population on all echelons of the U.S. economic system. Work will emphasize quantification

and suggested remedies for problems foreseen, and will include but not be limited to the following:

Phase I. A full structuring of the basic problems at all levels of operation and identification of interfaces, with suggested priorities for study in depth of the major economic sectors (such as commercial, manufacturing, and banking).

Development of a rationale for and a means for carrying out selection of critical industries (short term and industrial base recovery), essential workers therein, and definition of indispensable interfaces with such systems as transportation and material input.

Scope of Report

This report presents an overview of the work accomplished on Phase I of the economic study. A brief treatment is given to some of the major CR design features that would affect the economic-industrial environment. A definitional framework is introduced that permits the orderly study and discussion of problems of the economic system. Existing emergency countermeasure guidance is reviewed to define traditional approaches for alleviating emergency economic problems.

Specific problems of the various classes of the economic unit are identified as well as problems of the overall economic system. Principal elements examined include the individual or household, private business, government, and the financial system. Specific characteristics of each element that might cause problems are discussed as well as the subsequent impact on other elements of the system. Approaches and models appropriate for more detailed study are presented.

The relation of essential industry to national policy is developed, and a systematic approach is presented for identification of industry type and level of activity required during an emergency in risk and non-risk areas. Planning efforts that can be accomplished at the national, regional, and local level are described. Suggested priorities on study of problem areas and models are given, and new planning requirements and data needs are discussed.

References for Chapter I

1. Defense Civil Preparedness Agency, "High Risk Areas, for Civil Preparedness Nuclear Defense Planning Purposes," TR-82, April 1975.

2. W. M. Brown, "The Nuclear Crisis of 1979," Work Unit P4124A for Defense Civil Preparedness Agency, Washington, D.C., April 1975.

II. DESIGN CONSIDERATIONS

Among the basic considerations that should influence crisis relocation design are several that have a particularly strong impact on CR economic effects and measures. These considerations are concerned with the strategic role of the CR option, the likely response of the economic system to a national emergency, and the concepts and procedures used by government under emergency conditions. The overall CR plan must address these considerations if undue economic losses are to be avoided. The nature and significance of these considerations are summarized in the following paragraphs.

Continuity of the Economic System

A prevailing theme in the literature surrounding emergency economic measures is to keep the economic system running as a means of the most efficient use of available resources during the crises and rapid restoration of the economy thereafter. The rationale for this view includes: public familiarity with and investment in the current system, economy of effort in managing the system, and minimum distortions to the economy. This basic approach, however, would have to be limited by considerations of what levels of activity are possible and what is needed to provide for the minimum requirements of the various economic units.

To maintain the economy during crisis and afterward, efforts should be directed toward maintaining the solvency of economic units (e.g., the individual, business, local government, and banks). If the monetary system were to be maintained even in a limited form, a requirement would exist for assuring the continued functioning of financial institutions. Consideration should be given to prevention of undue losses or penalties to individual economic units, possibly by means of a limited moratorium.

In the economic area, as in other areas, government authority over essential operations must be maintained. Actions might be required to control prices prior to, during, and following the crisis relocation. Similarly, efforts might be required to prevent uncontrolled purchase and use of essential resources. Guidelines to prevent undue speculative financial activities might be needed. These and other similar considerations suggest strong government intervention to maintain the existing economic system while protecting the individual economic unit from unreasonable loss. Policy makers must decide what actions are required and when applied.

Phasing of Economic Measures

As with other areas of emergency control, economic measures should be invoked in a timely fashion. Because of the element of anticipation that enters into economic decisions, many of the economic problems would begin to appear early in the crisis buildup and probably before crisis relocation. Detrimental actions might include "runs" on banks, excessive demands, major price increases, speculative activity, etc. These incipient problems would require prompt government actions that are both effective and less restrictive than those considered appropriate in the relocation period. These pre-crisis relocation measures should be configured so as to lead smoothly into the more highly controlled environment following relocation.

The requirement for control and guidance for financial institutions following an attack has been recognized in current regulations and planning documents[1,2,3]. The specific assignments of responsibilities for emergency preparedness have been developed[4]. Some of the needed consumer measures (e.g., price control) are also contained in existing standby legislation. With expiration of price control authority in 1974, specific authority would have to be sought. However, the president's existing emergency powers are so great that a basis could be found for imposing direct economic controls as needed in a severe emergency. Some postattack problems of other economic units have been considered (e.g., production controls, delegation of authority). However, this previous guidance does not consider the CR option.

The capacity for timely introduction of needed measures prior to CR could also affect the strategic bargaining process. The ability of decision makers to invoke some CR economic readiness measures without the prospect of severe economic loss would help to assure that these strategic decisions are actually made when needed. The making of such decisions in a timely manner would be a demonstration of national will that could favorably affect the future course of the crisis.

Duration of the Relocation Period

The likely duration of the crisis relocation period has been recognized as a critical factor in determining the scale of economic losses, and economic and industrial requirements. The National Academy of Sciences[5] has suggested a minimum duration of one week, but did not attempt to estimate the maximum duration. In DCPA planning, a normal period of two weeks has often been used with some provision for a longer CR period. The fact that

planning must be undertaken with substantial uncertainty as to duration of the relocation period establishes a requirement for economic and other measures that would permit extension of the relocation posture for longer periods.

This capability to sustain CR for extended periods might also be an important consideration in crisis outcome. A U.S. system that is inferior in "staying capability" to the Soviet system might affect U.S. resolve and credibility in a crisis period. The Soviets might perceive that the United States has an obviously less effective CR system, one lacking staying power. In this event, the Soviets might believe that the United States could be forced into negotiations under extremely disadvantageous conditions.

An extended stay is not beyond the capability of the current CR design. Preliminary estimates from the economic/industrial viewpoint tend to indicate that the current CR design could sustain the relocation phase for at least 30 days. Longer periods might require substantial modifications of the current design but not necessarily the abandonment of the relocation posture altogether. With proper planning, the needed additional levels of industrial activity and economic support could be phased in so as to maintain a large (albeit lower) fraction of the population in a relocation posture. This capability for CR to "degrade gracefully" also prevents the adversary from identifying any obvious endpoint to the CR operation. From the viewpoint of reconstitution of the economy after crisis resolution, the scheduled phase-in of economic activity also provides more time for handling the many problems related to industry startup, employment, business liquidity, etc.

Reconstitution of the Economy

The economic impact of crisis relocation would not end with the return of evacuees to urban areas. The initial losses would continue to produce transient effects in the economic system for months or years thereafter. Industrial activity foregone in evacuated areas would result in a net loss. While some sectors might experience higher activity levels on reconstitution so as to recoup much of the initial loss, other sectors probably would not (e.g., utilities, financial, and other services). A large fraction of returning businesses and individuals would suffer from a lack of readily available money and other resources, thereby posing a threat to the desired rapid resumption of economic exchange and a threat to the financial viability of many economic units.

In addition, many individuals and businesses could be faced with civil penalties and liabilities growing out of inability to meet contractual agreements in a timely manner.

In the industrial sectors, the physical process of starting up activity, together with delays in shipments and supporting services, could delay full resumption of activity, thereby causing additional losses. Such factors could result in a period of high unemployment among risk and host area workers, following termination of CR. These and other problems suggest that planning must be undertaken and implemented at all levels of government to support and guide the economy for a considerable period following crisis relocation.

The distribution of losses among economic sectors and units would be a problem of equal importance. The nature of the CR operation is such that losses would be more concentrated among some groups than among others. Heaviest initial losses would be among those classes of workers and industries associated with urban areas. The losses would have an especially hard impact on low income workers and small businesses. From the moral, economic, and political points of view, it is apparent that some comprehensive form of loss sharing would be required to assure a rapid increase in industrial activity. Also, the fact that anticipation plays such an important role in the economy argues that a loss sharing plan be formulated and that the general contents of the plan be made known to the public prior to invoking the crisis relocation option. Lack of such knowledge could also affect the willingness of many people to relocate and to remain in host areas for the required period of time.

Balanced Planning

While it is anticipated that a CR posture could contribute to successful resolution of the deep crisis situation short of a strategic nuclear exchange, the system is also being designed as a practical means of saving lives in event that an attack on the United States actually occurs following a crisis. As a consequence, it is desirable that the system be so balanced as to operate with a minimum cost and disruption level regardless of the outcome.

The design characteristics configured for a peaceful outcome would conflict to some degree with the design characteristics for other outcomes. For example, in event of peaceful crisis resolution, the best measures would be those that did not disrupt the peacetime methods of performing essential

activities (e.g., using established risk area capabilities for food distribution, check clearing, payroll, etc.). In the event that the crisis ended with a strategic attack on CONUS, the best measures would be those that stressed host area self-sufficiency (e.g., movement of essential risk area activities to host areas during the crisis, movement of records, inventories, reorientation of supply routes, etc.). Because of these sometimes conflicting requirements, the CR designer should consider the tradeoffs among alternative measures to obtain the mix most likely to minimize penalties or minimize "regret" associated with alternative crisis outcomes.

The essential tradeoffs to be considered are among such factors as:

- o Efficiency of operations during the relocation period.
- o Degree of preparation for postattack operations.
- o Level of economic loss (public and private).
- o The number of people required in the risk areas.
- o Level of industrial and governmental activity in risk areas.
- o The capacity for sustaining the relocation posture.

Consideration of the efficiency of operations during the relocation period suggests the use of risk area capabilities for many services (e.g., payroll, check clearing); however, the need for post attack preparations might dictate the movement or duplication of at least part of these activities to host areas. Consideration of economic loss might indicate the desirability of maintaining in the risk area a larger work force than that required for minimum essential activity, but such a measure would mean larger numbers of people endangered in the event of attack. Post attack preparations might also suggest increased industrial production in risk areas and the movement of inventories and equipment out of risk areas; however, these measures might also mean a reduction in efficiency of operations during relocation, and higher ultimate cost if the crisis is resolved peacefully, as well as a greater exposure of people in risk areas. Increasing capacity to sustain the relocation posture might require a higher level of industrial activity among secondary suppliers, rotation of primary industrial facilities, and other measures which in turn might leave more people exposed in risk areas, reduce efficiency during relocation, and result in higher costs.

For these and other reasons, the utility of economic and other measures cannot be judged solely from a single point of view (e.g., peaceful resolution of the crisis). Economic and other measures must also be examined to assure that unacceptable penalties do not result from the occurrence of alternative crisis outcomes such as an extended duration of crisis, or a limited or complete strategic attack on CONUS.

Consideration of Government Roles

Economic problems and remedies would be significantly affected by the actions taken by all levels of government during and after the crisis. While government planners have not yet analyzed in any detail the economic aspects of crisis relocation, the general nature of government action in this situation is at least partially predictable from previously developed regulations and guidance related to large scale disasters, wars, and other emergency situations. Such prior information embodies the traditional concepts of government roles in such emergencies. Also, from the point of view of efficient operations and planning, it can be anticipated that CR economic measures will be developed that are compatible, to the extent possible, with approaches used by government in other such emergency situations.

While such prior information is a useful starting point, the CR option is sufficiently different from many other emergencies that prior guidance on emergency economic measures cannot be expected to be appropriate in all respects. Also, for the purposes of the present study, the use of such prior information should not be interpreted as a recommendation for adoption of the existing organizational responsibilities or mechanisms for the CR problem. The process of adapting existing organizations and mechanisms to the newly established needs remains the province of the government planner. The principal purpose in this study is to identify general concepts of government economic action in emergency and examine their applicability to the CR situation.

It is generally recognized that civil defense operations are the primary responsibility of local government with assistance from state and federal governments. However, in economic matters--under both emergency and non-emergency conditions--the federal government generally plays a dominant

role. An exception occurs when, by reason of attack damage, the federal government is unable to exercise its authority. Federal control has been found to be appropriate for a number of reasons including:

- o The interdependence of economic sectors and local economics across the nation.
- o Federal regulation of most financial institutions and systems.
- o The magnitude of federal economic resources compared with state and local governments.
- o National priorities for industrial activity.

Federal government is traditionally committed to providing necessary assistance for maintaining the viability of the nation's economy. In an emergency situation, the federal government in concert with state and local governments could be expected to assist individual economic units (e.g., individuals, businesses) to allow continued economic functioning both during and after the crisis. In war situations, the federal government is committed to assuring equitable sharing of war losses throughout the economy to the extent possible[6]. It is important to note that the purpose is "not to guarantee individuals against war losses but to assure the maintenance of a 'going concern' economy, to assure the viability of financial institutions, and to assure those dealing with financial institutions that they may do so without risk of the insolvency of such institutions by reason of war losses."[6]

A similar thread of reasoning runs through guidance related to regional-oriented disasters and emergencies[7]. Thus, if traditional approaches are maintained, the government could be expected to provide assistance for continued economic functioning of the system and its various parts; however, those parts would sustain differential losses. The degree to which inequities would continue to exist subsequent to the crisis would, as always, be a political as well as an economic issue. It is important, however, that these possible inequities not be perceived in advance as directed primarily against risk area population and business, for otherwise this reaction could reduce CR support.

Government has a number of mechanisms for supporting those adversely affected by war or disaster. Minimal emergency services including temporary housing, food, health services, and clothing are normally supplied at no cost

to the needy. Direct and indirect financial assistance is generally provided by government both during and after an emergency by means of low interest loans, grants, unemployment benefits, contract preference, and other mechanisms. Recovery of damaged or inoperable facilities and homes is supported by government through direct payments, grants, and low-interest loans. The use of the specific guidance and legislation[6,7] in the CR situation is questionable because of the orientation of these sources either to regional disasters or to postattack recovery. However, insofar as the necessity of government assistance is concerned, the scale of the CR problem and the lack of other vehicles than government appear to be arguments for, rather than against, continued reliance on government economic assistance.

Economic control activities support efforts to maintain the economy in emergencies and to restore normal economic functioning of the system thereafter. Measures include direct controls on financial institution operations, and price and wage control, together with accompanying rationing of goods as required[6,8,9]. The characteristics of CR require that such measures must be suitable for rapid and flexible implementation during and after the crisis. Also, due to the possible rapid onset and end of the crisis measures, they must be capable of functioning with a minimum of added government administrative staffing and control.

Governments, primarily the federal government, have available a number of financial mechanisms directed toward economic stabilization. The primary thrust of these actions is to maintain both the liquidity and the financial viability of economic units without incurring unmanageable inflation and other undesirable economic conditions. The keystone of this approach is the maintenance of essential banking operations to provide economic units with access to funds, credits and services essential for continuing operations[1,6,10,11,12]. Bank liquidity and viability would be maintained by providing easier access to essential funds through various mechanisms (e.g., adjustment of reserve requirements, discount rates, open-market operations, and delayed claims on federal deposits). Economic viability

would also be protected by assurances from the government against losses to financial institutions during an emergency resulting from provision of valid services. Federal government through direct regulation and through various monetary means would restrict credit and access to, and transfer of, individual account funds from banks for purposes such as speculation. Government, while traditionally avoiding a general moratorium[10], could use selected moratoria as needed to prevent implementations of penalties and legal actions resulting from inability to perform on contracts or obligations within stated periods.

The federal government has traditionally exerted a wide range of controls over industrial activity during wars or other national emergencies[4]. Controls may be a mandatory assignment of production priorities, or may be indirect means such as the control of input resources to industry, the regulation of loans, and the use of tax policy[13,14,15]. Provision of labor for essential industry has traditionally made use of economic incentives, often against a background of standby authority to invoke mandatory controls, if needed. Such economic incentives would appear to be an important factor in maintaining essential industry and key workers in risk areas during crisis relocation. Economic support might be required for essential industries in order to protect them against loss resulting from possible imbalanced and inefficient production or services. Economic motivations of key workers would include the desire to avoid loss of current income and a desire to protect their jobs.

The necessary pre-planning for identification and regulation of essential industry in risk areas has a precedent in defense mobilization planning, and in the authorities granted to various government departments[4]. Economic incentives for cooperation by industry include: the desire to protect against economic loss associated with shutdown, to be eligible for emergency loans, to have preference in contracting, to be knowledgeable about considerations relating to corporate planning, and others.

The federal government thus has a wide range of legislation, regulations, and guidance documents that outline traditional approaches to economic and industrial planning for war and other regional and national emergencies.

Crisis relocation is, however, sufficiently different from the conditions assumed in the legislative and technical base that a careful review is required. Types of measures appropriate to each phase of a developing crisis and the legal basis for their prompt implementation deserve continuing study.

References for Chapter II

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III. DEFINITIONAL STRUCTURE FOR ECONOMIC/INDUSTRIAL PROBLEMS OF CRISIS RELOCATION

General Categories

In addressing any new problem area in the field of civil defense, it is generally desirable to start with a set of definitions or a definitional structure that categorizes situations into small classes that can be usefully subjected to detailed examination. While no such definitional structure has yet been developed for crisis relocation, many useful definitions have emerged in prior research and planning. These definitions, together with considerations peculiar to economic activities, provide the basis for the definitional structure presented in this section.

Organizational elements must be considered in the definitional structure so as to identify distinctively different problems and roles. The economic problems and capabilities of an individual would be much different from those of a local business organization, a regional financial system, or a local city government. Situations would also vary significantly with the urbanized character and geographical location of the organizational element. Thus, the problems and capacities of an individual working in a risk area could be quite different from those of a person whose normal activities are restricted to a host area.

Important changes in problems and roles could be expected with time and with changes in crisis conditions. Principal economic considerations of a small business would vary, depending on the period of relocation or the time of returning to normal operations. Crisis relocation would also cause important differential effects on economic units as a result of the role the unit is to play in CR (e.g., essential producer, non-essential producer, etc.). Assistance requirements could be quite different for a salaried worker, a pensioner, or a welfare recipient. Occupations or sources of income would also be important in determining the extent of probable economic problems.

From the economic viewpoint, a minimum description of basic situations requires the specification of four characteristics: organizational element, type of area, operational phase, and activity class. A minimum set of descriptors appropriate to each characteristic is presented in Table 1.

Table 1

MINIMUM SET OF DESCRIPTORS FOR
BASIC SITUATION CHARACTERISTICS

Characteristics	Descriptors
Organizational element	Individual/family
	Private business
	Financial institutions
	Local/state governments
	Federal government
Type of area	Risk
	Host
	Regional
	Nationwide
Operational phase	Pre-CR Crisis
	CR-Initiation
	CR-Maintenance
	CR-Reconstitution
Activity class	Essential producer
	Non-essential producer
	Non-producer (rentier)
	Non-producer (welfare)

The various combinations of one descriptor from each characteristic category provide a set of basic situations suitable for more detailed examination. Basic situations would include combinations such as:

- o "Individual, Risk, CR-Initiation, Non-essential producer" describes an individual who has a job in the risk area during the period when crisis relocation is initiated, and who is designated as a non-essential worker.
- o "Private business, Risk, CR-Reconstitution, Non-essential producer" describes a business that is located in the risk area and is attempting to start up operations at the end of crisis relocation, after being closed during the crisis period (non-essential activity).
- o "Financial institution, Regional, CR-Maintenance, Essential producer" describes a financial institution (e.g., a bank) that provides services to a region including risk and non-risk areas, and is trying to maintain essential services during the CR-Maintenance period.

The descriptors in Table 1 represent a minimum description of basic situations for present study purposes. Organizational elements reflect major differences among economic units in terms of sources of income and categories of payments, regulatory conditions, etc. Area type reflects degree of urbanization or geographical extent, both of which are important in determining the nature of the crisis relocation role. The operational phase descriptors represent distinct changes in crisis conditions or crisis relocation posture which would give rise to different national objectives. The activity classification contains the generally recognized distinction between essential and non-essential activities. The classification also contains references to "non-producers" such as economic units receiving most support from welfare or investments.

Operational Phases from an Economic Viewpoint

With respect to operational phases, the Pre-CR Crisis Phase represents the period during which the crisis is building up but which occurs prior to use of the relocation option. Depending upon the scenario, this time interval could range from a few days to several weeks[1]. The CR-Initiation Phase is the period during which the mass movement of risk area population is taking place, nominally estimated as not more than three days[2]. The CR-Maintenance Phase constitutes the period immediately after crisis

relocation movement when emergency support is provided for the evacuees in host areas. This phase covers the period until the crisis is over and the crisis relocation posture is relaxed -- a period of one to several weeks. The CR-Reconstitution Phase begins with the relaxation of the crisis relocation posture and the return of evacuees to risk areas, and continues until satisfactory post-crisis economic conditions have been reestablished in the economy.

In the event of an attack, the CR-Maintenance Phase would change into an emergency operations phase followed by a recovery phase[3]. While these latter outcomes are not discussed in this report, the changed target dispositions implied by CR will require a review and modification of emergency plans at the federal, state, and local levels. Discussion in this report is centered on conditions where the crisis relocation is followed by return to urban areas without the occurrence of a strategic nuclear attack.

The general goals of the economic effort (e.g., "assure continuity of the economy," "maintain confidence," etc.) are translated into more specific objectives in each operational phase. In the Pre-CR Crisis Phase, the objectives are:

- To protect the economy from detrimental actions of individuals and groups.
- To increase economic readiness to move into the crisis relocation option.

The first of these objectives would dictate efforts to restrain abnormal activities that would tend to destabilize the economic system, including such actions as "runs" on banks, excessive demand, undue speculative activity, etc. Increased readiness could take many forms including completion of plans for transfers of records, authorities, and operational capabilities to host areas; indoctrination of the population as to economic aspects of crisis relocation; and other activities.

During the short period when the relocation process is underway, the level of disruption is likely to be so great as to preclude all but the most rudimentary economic activities. The economic objectives in this phase would be to institute the full range of emergency economic regulations; to protect the economy and its elements from undue damage brought on by the

movement process; and to assure the readiness of economic institutions to resume essential economic activities when the population has completed the relocation phase.

During the period when the risk area population is maintained in the relocation sites, the objectives include:

- o To maintain the normal economic system and institutions.
- o To maintain the minimum essential level of economic activity.
- o To provide the necessary economic resources to sustain the population.

These objectives would suggest the use of the normal money economy and normal economic institutions under such additional regulations as might be necessary for stability to meet the immediate needs of evacuees and others disrupted by the relocation.

Because of the disruption and loss brought on by the relocation, economic measures in the reconstitution phase would entail more than just a relaxation of controls. The overriding objectives during this phase are:

- o To restore satisfactory post-crisis economic conditions as rapidly as possible.
- o To provide selective assistance for sectors and groups to ameliorate unsustainable damage and to accelerate recovery.

Table 2 summarizes the general and economic objectives for the four operational phases.

Table 2

OBJECTIVES BY OPERATIONAL PHASE

Phase	Situation	General Objectives	Economic Objectives
Pre-CR Crisis	Crisis buildup	Maintain existing economy Increase CR readiness	Protect economy from detrimental actions Increase economic system readiness
CR-Initiation	Relocate risk population to host areas	Reduce risks to population Provide essential support	Place economic system on emergency basis Protect the system Assure readiness to resume essential functions
CR-Maintenance	Sustain evacuees in host areas	Provide needed support to evacuees Improve defensive preparations	Maintain essential economic activities Provide adequate economic resources to host areas
CR-Reconstitution	Return of evacuees and reestablish normal activities	Achieve satisfactory post-crisis economy Ameliorate CR residual effects	Restore economic system Maintain viability of economic units

References for Chapter III

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IV. SPECIFIC ECONOMIC IMPACT OF CRISIS RELOCATION

General

Many definitions have been put forward to describe that complex and dynamic process known as the economy. For present purposes, the following definition of the economy appears to be most appropriate:

> An economy is an organized system wherein men and society choose, with or without the use of money, how to employ scarce productive resources to produce various commodities over time and distribute them for consumption, now and in the future, among various people and groups in society*.

The definition throws light on the many aspects of the economy that must be examined to obtain a proper assessment of economic problems induced by crisis and crisis relocation. As an "organized system" the economy acts to provide efficient utilization of resources through various means of exchange that will meet the needs of the participating economic units. Disruption of the system, as by crisis, would introduce transient effects that would affect system organization and efficiency with continuing losses over a considerable period of time. The fact that the economy must produce and distribute "now and in the future" indicates that the economy is fundamentally a continuous process producing a constant stream of goods and services. Consideration must therefore be given to how the minimum needs of the participants are to be met during a period of crisis when production is disrupted, and how the various discontinued and time-dependent economic activities are to be reconciled following the crisis.

The system is basically directed by "men and society," and consequently it is necessary to examine individual, institutional, and other group methods of operation (the body of economic rules within which individuals, groups, and institutions undertake economic actions). Men and society direct the use of "scarce productive resources," which requires consideration of the labor, material, and capital needed to produce the desired stream of goods and services.

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*Adapted from a definition in Economics: An Introductory Analysis, Paul Samuelson, McGraw-Hill (latest edition), New York, N.Y.

The motivating force of the economy is the benefits gained through supplying present and future "consumption demand among various people and groups in society." Thus, an appraisal of economic conditions requires examination of the normal behavior of all consumers of products and services, and examination as to how this behavior is likely to change, based on perceptions of the immediate consequences of the crisis and its aftermath.

In this section, an examination is made of the likely reactions of various important classes of economic units to CR: individual/family, private business, financial institutions, and local government agencies. Economic characteristics that would determine their problems are summarized, followed by a more detailed description of specific economic problems as the economic unit moves through the various phases of the crisis. Principal needs are identified for each class of economic unit.

Economic Impact of Crisis Relocation on the Individual

A. General Economic Characteristics

The economic characteristics of the individual, family, or household are exhaustively documented in the statistical publications of the Bureau of the Census and other sources. Only a brief summary of data is presented here, to permit an appraisal of particularly important characteristics affected by crisis relocation. In this respect, knowledge of the sources of income (e.g., private business, government transfer payments) is needed to assess the likelihood of several modes of income disruption. Types and amounts of expenditures are factors in assessing impact, especially with respect to distinctions between essential and non-essential expenditures. Current economic resources (e.g., assets, liabilities, credit availability, etc.) are important factors in determining the ability of the individual to maintain himself during and after the crisis.

The sources of income for families and for unrelated individuals in the United States is given in Table 3. The predominant source of income is, of course, wages and salaries. Generally, this income is received from one or two sources and would be subject to complete disruption by relocation and closing of places of employment. A substantial percentage of the population

Table 3

SOURCES OF INCOME FOR U.S. POPULATION
(Percent)

Source of Income	1970	1974
Wages and salary disbursements	67.1%	65.3%
Other labor income*	4.0	4.5
Proprietor's income	8.3	8.1
Rental incomes of persons	3.0	2.3
Dividends	3.1	2.8
Interest	8.4	9.0
Transfer payments†	9.8	12.2
Social insurance	3.5	4.2
Total Personal Income ($ billion)	$808.3	$1,150.5

*Employer contributions to pensions, compensation for injuries, etc.

†Not included in definition of personal income.

Source: Statistical Abstracts of the United States, Table 626, Bureau of the Census, 1975.

receive income from public sources and investments might or might not be stopped by crisis relocation. Most of this group also receive supplementary income in the form of wages and salaries and might therefore also experience economic disruption.

The amount and distribution of income among the population is given in Table 4 for 1970 and for a more recent period. The income of the majority of individuals and households is ample by any historical measure, and it would therefore appear that most families could suffer a loss of income over a short period of time without significant damage to their long-term economic condition. However, while the median family income[1] in 1974 was $12,836, 10.6% of families and 11.6% of all persons were classified as poor (e.g., under $2,495 for non-farm individual, and under $5,038 for a non-farm family of four)[2]. Consequently, in assessing CR economic impact, it is necessary to consider not only the average individual but also the condition of the more economically vulnerable segment of the population. The remedies for this latter group could be different from those for the rest of the population.

A great disparity also exists in the holdings of liquid assets (e.g., savings accounts, certificates of deposit, and checking accounts). Most families would have sufficient liquid assets to sustain them through several weeks' period of loss of income. However, in 1970, 16% of families reported holding no liquid assets, while 30% reported less than $200[3]. The indications are therefore that well over one-third of the families would not have sufficient liquid assets to support even a minimal standard of living without their regular income. This latter group would in most instances be required to borrow, delay paying current obligations, further reduce their standard of living, or obtain some (other) form of public assistance. In 1970, about 51% of the families had an amount equal to two or more months of salary in a checking or savings account[4].

Credit is a primary means of expanding the purchasing power of the individual; however, such credit arrangements create additional obligations that generally require payments on a regular basis. These obligations add

Table 4

MONEY INCOME OF U.S. FAMILIES*

Income Level	% of all families 1970	1974
Under $1,000	1.6%	1.3%
$ 1,000 - 1,999	3.0	1.3
$ 2,000 - 2,999	4.3	2.7
$ 3,000 - 3,999	5.1	3.6
$ 4,000 - 4,999	5.3	4.1
$ 5,000 - 5,999	5.8	4.4
$ 6,000 - 6,999	6.0	4.4
$ 7,000 - 9,999	19.9	13.8
$10,000 - 14,999	26.8	24.3
$15,000 and over	22.3	39.8

*Source: Statistical Abstracts, Table 631, Bureau of the Census, 1975.

to events a certain momentum that works against a reduction in total expenditures over the short term. Principal obligations of the individual or family include mortgages, installment debt, and a variety of revolving credit instruments such as credit cards, monthly retail store accounts, etc. In 1970, 49% of families had some installment debt, with a median outstanding debt among borrowing families of $940 which would not be a major factor for moderate to high income families. However, a higher level of debt is to be found among younger families (age of head under 35 years) with about 21% of these households showing installment debt in excess of $2,000. Credit cards are widely used but are by no means universal: non-gasoline credit cards are used by about two-thirds of median income families and only about one-third of poverty level families[3]. The total amount of credit card debt outstanding has been increasing rapidly from $3.8 billion in 1970 to $8.3 billion in 1974--an increase of 118%. This compares with an increase in total credit of 50% for the same period[1].

Mortgage debt is an important factor in determining the individual's economic condition. In 1970, there were about 40 million owner-occupied dwellings of which about 60% were mortgaged[1]. Between 1970 and 1974, mortgage debt increased by 52%[3].

Employee fringe benefits are an increasingly important part of the economic benefits received in private industry and government. Currently these benefits are running about 30% of base salary in private industry and somewhat higher in federal government. Annual leave is an important accrued benefit that might assist the employee in the event of a stoppage in work. Employees with long service records (five years or more) generally accrue two weeks or more leave per year. However, 38% of non-office employees with under two years' service receive less than two weeks vacation per year[5]. The amount of accrued vacation is, of course, dependent on the season. A "Missiles of October" scenario would find most employees with little annual leave. Unemployment benefits are included in some labor contracts, and other workers are entitled to public assistance under certain circumstances which, however, did not anticipate crisis relocation. Other important

benefits of employment which the individual cannot afford to forfeit during a disruption of work include medical coverage, accident insurance, life insurance, etc.

It has been generally noted that expenditures of the individual or family are closely tied to income. Expenditures have been shown to persist for a considerable period even with a decline in income[6*], so that current budgets provide an initial basis for estimating likely expenditures in the CR-Reconstitution Phase. Estimated budgets for individuals and families are published frequently by the Bureau of Labor Statistics. In Table 5, 1973 expenditure data for low, intermediate, and high budgets have been normalized to provide representative data for the period 1970 - 1975[+].

A comparison of the low-level budget ($8,181) with the intermediate and high level budgets ($12,626 and $18,201) suggests that substantial cuts could be made in the budgets of most families above the poverty class, at least over periods of several months. Consideration of possible savings for expenditure types together with the normal average private savings rate indicates possibility of reductions of the order of 20% for the median budget (income) group and at least 30% for the high budget (income) group[**]. By this means, the median income group could overcome the loss of one month's income in about 5 months and the higher income group in less than 3 months. Normal economic behavior and the liquid assets available to most median to high income families suggest that the decline in budget expenditures would

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*In the light of recent inflationary trends, this might be better interpreted as a decline in "real" income.

+The largest change was in the budget for food which has increased from 23% to 25% in the period 1970 to 1973.

**Estimates were obtained by making the assumption that families in intermediate and high budgets could temporarily reduce expenditures to the level of the low budget in some categories (e.g., food, clothing, personal care, and recreation), and that such families had a normal savings rate equal to the national average.

Table 5

REPRESENTATIVE BUDGETS FOR A FAMILY OF FOUR

Type of Expenditure	Budget Level (%)		
	Low	Intermediate	High
Food	29.8%	25.2%	22.1%
Household	19.9	23.0	24.1
Transportation	6.9	8.0	7.2
Clothing	8.5	7.9	8.0
Personal care	2.5	2.2	2.1
Medical	8.1	5.3	3.8
Recreation, education, and associated consumption	4.8	5.2	6.5
Other expenses	4.7	4.8	5.6
Social security	6.0	5.1	3.6
Income tax	8.8	12.7	16.9
Total Budget 1970	$6,960.	$10,666.	$15,511.
Total Budget 1973	8,181.	12,626.	18,201.
Total Budget 1974	9,198.	14,333.	20,777.

Sources: Handbook of Labor Statistics, Bureau of Labor Statistics, 1975.
Statistical Abstracts of the United States, Table 693,
Bureau of the Census, 1975.

not reach the above estimated levels; however, the reduction in spending could still have significant impact on industry in the CR-Reconstitution period. Decreasing expenditures in the CR-Reconstitution period would automatically decrease total demand on industrial and other systems and slow the process of economic recovery. This condition might be a necessary outcome or consequence of a crisis relocation, unless government aid was furnished to individuals and families.

The possible impact of crisis conditions on the individual economic unit is summarized in the next section for the four operational phases: Pre-CR Crisis, CR-Initiation, CR-Maintenance, and CR-Reconstitution. Table 6 presents a summary of major factors affecting individual income, expenditures, and economic resources.

B. The Individual During the Pre-CR Crisis Phase

The economic condition and behavior of the individual could be significantly influenced during crisis well before the initiation of crisis relocation. Current income could be reduced by a number of events such as unemployment or underemployment. It has been suggested that spontaneous evacuation might be undertaken by 10-20% of the risk area population[2], presumably including workers. A slowdown in employing organizations in both host and risk areas could result from absenteeism, as well as from poor performance by suppliers and supporting services. Slowdown could also result from management decisions to hedge against the uncertainty by manipulating inventories, building up cash, etc. Some industries in the risk areas, especially smaller ones with one or a few owners, might decide to shut down operations prematurely to seek personal safety. Changes in consumer demand during this period might also cause reduction of employment in some industries and increases in others. A slowdown in industrial activity of about 10% in urban areas could approximately double the current rate of unemployment.

Payment of salaries and other income might be slowed because of developing staff problems or overloaded capacities in financial departments, or because of a general policy of slow payment, or delays in mail and other supporting services. This situation would tend to further reduce labor productivity and require the individual to place greater reliance on savings and credit for needed funds. Since 30% of families have insignificant liquid assets, an additional load would be placed on public assistance resources.

Table 6

CRISIS IMPACT ON INDIVIDUAL/FAMILY ECONOMIC BEHAVIOR

Operation Phase	Income	Expenditures	Resources
Pre-CR Crisis	Selective unemployment Absenteeism Underemployment Slowdown in receivables	New demand patterns Excessive buying Increased prices Shortages Speculation	Restriction on use of liquid assets Rapid change in asset values Credit limitations
CR-Initiation	Stoppage of income Increased income (host area) Distress sales	Relocation costs Initial needs in host area	Cash shortages Unavailability of credit Unacceptability of checks
CR-Maintenance	Loss of employment income Disruption of payment of receivables Increased income (host area) Payment for emergency services Public assistance	CR maintenance costs Supply and price controls Competition (host area)	Cash shortage Restricted credit and check use Damage to assets (risk area) Overdue obligations
CR-Reconstitution	Slow reemployment Temporary underemployment Delayed payment of receivables	Demand for necessities Reduction in discretionary expenditures Slow payment of obligations Supply and price controls Asset repair and maintenance costs	Reduced liquid assets (evacuees) Changed asset values Overdue obligations Restrictions on credit Accrued benefits Government assistance

Individual consumer behavior could also be significantly influenced by crisis. Demand patterns might tend to shift toward the acquisition of those goods and services perceived to be of most use during crisis relocation or after attack. In the absence of government controls, necessities such as food, clothing, emergency supplies, etc. could be subject to hoarding and accompanying price rises and shortages. Demand for other items such as household durables might decrease in risk areas but could increase in non-risk areas. In general, the individual might be tending to increase purchases at a time when his income and access to cash and credit were diminishing.

Financial institutions, either voluntarily or through government action, would begin to take action to control speculative activity and to preserve the stability of the financial systems. The individual might find retailers increasingly reluctant to accept checks or to allow use of credit. Restriction on national credit systems might also be imposed (e.g., credit cards). The individual could be faced with a significant change in the value of various assets together with an inability to exchange them through normal institutional channels (e.g., securities markets). In extreme situations, forced sales or barter might be undertaken by individuals on very disadvantageous terms.

As a result, unless careful conservation were practiced, the individual could find himself without immediately available financial resources even before crisis relocation. These considerations suggest the need for the following government measures:

- Prompt action before crisis relocation to limit undue speculation, prevent unwarranted price increases, and allocate essential materials for final consumption and essential industry.
- Actions to assure continued functioning of the mails, transportation systems, and other support services.
- Provision for continuing minimal income of poverty level families and fringe benefit protection for all workers.
- Public information and other services to maintain production and employment as near as possible to desired levels during the pre-CR Crisis Phase.
- Public actions and assurances as to the safety of individual financial assets, and provisions for access to liquid assets to cover essential needs.

- o Public information on economic and other services available to individuals in host areas.

C. The Individual During the CR-Initiation Phase

The initiation of the crisis relocation movement would probably bring most routine economic activity to a standstill in risk and host areas for several days. A significant fraction of workers might forfeit wages during this period because of need to relocate families, the shutdown of industrial facilities, the lack of transportation or transportation routes, etc. Disposable wages of employees and proprietors in urban (risk) areas in 1973 totaled about $1 billion per day[1,8]. Income from other sources such as investments, public assistance, and rents might not be received during this period. Financial assets and credit might be unavailable during this interval because of the difficulties in maintaining financial operations, the general uncertainty at the retail level as to individual solvency, and the possible desire of local businessmen to accumulate and transfer funds to non-risk areas.

These conditions might require the individual to limit himself to cash in hand at the start of crisis relocation, together with whatever public and private assistance might be forthcoming. Since currency in private hands presently represents less than 6% of private liquid assets[1*], currency holdings would generally prove inadequate. In the absence of public and private assistance, some individuals might engage in distress sales of personal assets or various forms of inefficient or destructive behavior.

In most instances, host area residents should be able to maintain themselves on available household inventories for the necessary period of days. Evacuees arriving in host areas, however, would require a variety of goods and services whose cost would have to be borne by the individual or by a public agency. Under traditional emergency service concepts, the evacuees would not be expected to pay for such emergency assistance at congregate care centers at least for some interim period[9]. Many might not be willing or able to pay in any event. On the other hand, some evacuees with sufficient cash in hand could compete for available private accommodations and services in the host areas, with inevitable shortages and upward pressure on prices.

These considerations suggest the need for the following measures during the CR-Initiation Phase:

- o Arrangements to make unnecessary any out-of-pocket payments by evacuees when relocating and when making use of congregate care facilities.
- o Controls to prevent unwarranted competition for available private accommodations and services in host areas.
- o Measures to rapidly re-establish the functioning of the economic system so as to provide income and controlled access to assets for individuals.

D. The Individual During the CR-Maintenance Phase

Once established in the relocation posture, individuals would continue to face economic problems and pressures. Most evacuees and some host area workers would be unemployed except for such emergency service work as might be occasioned by CR maintenance efforts and attack preparations. Payments of accrued earnings, vacation, investment returns, rents, etc. might be delayed or deferred for the duration because of possible disruption of the mail system, the shutdown of financial departments of businesses in the risk areas, etc. While evacuees and some host area residents would suffer income loss, others in host areas might be able to increase income substantially by providing goods and services to government, evacuees, and others.

Those employed by, or receiving transfer payments from, governments might or might not receive income from these sources, depending on whether financial departments were operating, whether individual eligibility for payments was maintained, etc. Those eligible for public assistance from local governments in risk areas might be without this source of income during the CR-Maintenance Phase. Since government salaries and transfer payments account for 28% of national income[10], policies regarding payments during the CR-Maintenance Phase would have a significant impact on the economy during and immediately after the crisis.

Depending upon government policy, evacuees might or might not have to pay for some portion of their maintenance costs. If charges were to be made, then payment would probably have to be deferred until after the crisis. If free services were provided, this would tend to equalize losses

among the population. However, free services could allow evacuees with available cash to compete with host area populations for other host area products and services. Credit and check cashing might be restricted for evacuees because of uncertainties on individual solvency, operational limitations of banks, and government policy. Services might be improved by a number of mechanisms such as through the assistance of larger organizations with which the individual was identified (e.g., employing organization, congregate care facility, etc.).

Evacuees would also be faced with problems growing out of their normal economic commitments. Overdue payments would accrue on continuing items such as housing, installment payments, non-installment debt, and insurance. Average payments would be about $150 per capita[1,11] in 1975. If most people were relocated from all urbanized areas, accumulation of payments on prior obligations would be about $5 billion per week.

The evacuees would also be concerned about risks of damage and lack of maintenance and personal property left in the risk area. This factor could reduce the number and productivity of evacuee labor in the host areas, as well as the productivity of key workers.

These and other similar considerations suggest the need for the following measures during the CR-Maintenance Phase:

- o Continuation of a system of providing minimal needs of individuals without out-of-pocket payments.
- o Development of procedures to prevent competition for goods and services in the host areas and to assure an equitable distribution of such resources.
- o Public actions and assurance to protect private property in risk areas.
- o Actions to maintain continued flow of transfer payments, government salaries, and other feasible sources of income.

E. The Individual During the CR-Reconstitution Phase

The economic problems would not end with the relaxation of the relocation posture. The individual returning to the risk area, as well as unemployed host area workers, would be faced with an accumulation of overdue payments and depleted resources. At the same time, many of these people might be faced with an additional period of unemployment or underemployment because of slow startup of industrial activity, a temporary reduction in demand for their employers' services, etc.

Payments on investments might be delayed somewhat by the backlog of work accumulated during the period when financial sections of industry were closed down. Rental income might be slow because of inability of renters to pay immediately.

Individuals at a minimum would be faced with the necessity of meeting accumulated debt payments (i.e., average $150 per month) and purchasing essentials in order to resume independent living. Essentials other than prior obligations would include, over the short term: food, transportation, medical service, and other miscellaneous costs. Assuming that over the short term these costs were maintained close to a minimum budget[1*], the per capita cost would be approximately $100 per month.

Because of general reduction in cash and the buildup of payments on prior obligations, discretionary purchases might remain abnormally low for a substantial period of time. Demands for credit by the industrial sector to permit resumption of operations might also restrict credit to individuals unless government action was undertaken.

In addition to the problems of obtaining resources sufficient to resume normal living, individual concern could be expected about inequities resulting from the crisis relocation. Since evacuation would involve urban areas, one of the groups suffering most would be the urban area worker. At the same time, some economic units and sectors might have benefited from the crisis. Some reduction in the inequities would therefore be desirable on moral, political, and economic grounds.

A number of actions for ameliorating these problems are possible and should be examined in depth. For instance, employers might promptly provide employees with accrued earnings, vacation pay, and other benefits. This step might be feasible for larger industries; however, it is questionable for smaller companies which generally face difficult cash flow problems even under normal circumstances. Government policies might be adopted to make credit available to private business for meeting obligations to employees as well as for other purposes. Government transfer payments might also be made directly to individuals to meet prior obligations and immediate needs.

*Table 693, Statistical Abstracts.

These considerations suggest the following types of government action:

- Immediate government financial aid to assist in resumption of pre-crisis lifestyles should be provided to evacuees and host area unemployed on termination of the relocation posture.
- Provision should be made to prevent penalties and legal actions arising out of the individual's inability to promptly satisfy prior obligations or contracts.
- Loss sharing measures should be examined as a means of reducing the inequities incurred during crisis relocation among individuals, groups, and sectors.

Economic Impact of Crisis Relocation on Private Business

A. General Economic Characteristics

Businesses are defined in accordance with Internal Revenue Service (IRS) practices and include all individuals and organizations filing Schedule C Forms, Partnership, or Corporate Income Tax Returns. This definition is broad, covering the activities of the very largest corporations and of the part-time workers who produce a product or service in their homes. It includes all profit motivated economic activities; it excludes activities of governments and certain non-profit organizations.

The IRS reports in 1970 indicated that there were 12 million businesses in the United States with gross revenues exceeding 2 trillion dollars[1*]. The number of businesses has been increasing at about 4%, and receipts at about 10% per year. These businesses represent the major source of production, income, and capital of our economy. In Table 7, GNP is classified by type of product, by type of expenditure, and by producing sectors. The table indicates that while total GNP has been expanding, the breakdowns by product, expenditure, and sector type have remained quite stable. About 85% of the GNP originates in business, and most wages, salaries, income, and profits originate in private business. Expenditures by government are a significant but relatively small portion of total national income.

Because business activities are so broad and diverse, it is helpful to disaggregate total activity into its major industrial sectors. Table 8 shows the number of firms, their revenues, and their wages.

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*Table 800, Statistical Abstracts.

Table 7

CLASSIFICATIONS OF GROSS NATIONAL PRODUCT

Total Gross National Product	% of Total By Year 1970	1974
By type of product		
Goods output	48.2%	48.0%
Services	42.0	42.2
Structures	9.8	9.8
By type of expenditures		
Personal consumption	63.2	62.8
Private domestic investment	13.9	15.0
Net exports	0.4	0.1
Government purchases	22.5	22.1
By sector		
Business	84.6	84.3
Households and institutions	3.2	3.4
Rest of world	0.5	0.8
General government	11.7	11.5
Total GNP ($ billions)	$977.1	$1,397.0
Current GNP (June 1976, $ billions)	$1,619.0*	

*Sources: Statistical Abstracts of the United States, Table 614, Bureau of the Census, 1975.
Commerce Business Daily, June 1976.

Table 8

CLASSIFICATION OF BUSINESSES BY
MAJOR INDUSTRIAL SECTOR

Sector	Number of Businesses (thousands)	Receipts (%)	Salaries and Wages (%)
Agriculture	3,240	3.1%	0.7%
Mining	80	1.0	1.4
Construction	875	5.7	7.5
Manufacturing	410	35.0	37.0
Public Utilities	380	7.0	3.7
Wholesale trade	470	13.0	6.1
Retail trade	2,291	19.1	14.8
Financial	1,292	9.8	6.3
Services	2,962	6.3	16.4
All business (1970)	12,000	$2,036 billion	$427 billion
All business (1972)	12,978	$2,495 billion	

Sources: Statistical Abstracts of the United States, Bureau of the Census, 1975.

Statistics of Income 1970: Business Income Tax Returns, Dept. of Treasury, IRS Pub. 438, October 1973.

The largest number of businesses is in agriculture, a non-urban area industry; however, agriculture represents only a minor fraction of total business receipts. Mining is also generally located in non-urban areas. Wholesale and retail trade and financial businesses are heavily concentrated in urban areas. Transportation, communication, and public utility activities are widely dispersed, but their control centers and densest networks are in the risk areas. Construction, retail trade, and services tend to be distributed as the general population.

Over half of the total of $2,036 trillion of business receipts is accounted for by the 30,000 large businesses which do over $5 million volume per year (Table 9). Most of these large businesses are corporations, contrasting to a vast majority of smaller businesses -- those doing under $500,000 volume per year, which are generally individual proprietors.

The degree of concentration of revenues by size of business is highly variable between industrial sectors. For example, in agriculture and retail trade, over half of all revenues are generated by firms with annual receipts under $500,000. At the other extreme, in manufacturing and public utilities, over 80% of revenues are generated by large businesses. The difference in distributions by industrial sector even at this primary level of disaggregation illustrates the extreme variations among American businesses.

The response of business to crisis relocation would be influenced by the financial structures of the various firms. Table 10 presents 1970 data for all businesses and for each major industrial sector. These data are the average* values for income statement and balance sheet categories.

As shown in Table 10, total receipts for the average business amount to $170,000, its expenses amount to $160,000, and its profits (before taxes) are $10,000. Total assets of the average business amount to $185,000, slightly more than its annual sales. Its cash, accounts receivable, and inventories are

*"Average" was derived by dividing the total receipts for the sector by the total number of businesses. Each accounting item value was derived by prorating the sector total for the item according to the ratio of receipts to numbers of businesses.

Table 9

CLASSIFICATION OF BUSINESSES BY SIZE
(1970)

All Businesses	Total (thousands)	Under $500 (thousands)	$500-$5,000 (thousands)	Over $5,000 (thousands)
Number				
Corporations	1,665	1,359	277	29
Proprietor & partnership	10,336	10,278	57	1
Total	12,001	11,637	334	30
Receipts	($ billions)	($ billions)	($ billions)	($ billions)
Corporations	$ 1,706	$ 149	$ 375	$ 1,182
Proprietor & partnership	330	258	57	15
Total	$ 2,036	$ 407	$ 432	$ 1,197

Sources: Statistical Abstracts of the United States, Bureau of the Census, 1975.

Statistics on Income 1970: Business Income Tax Returns, Dept. of Treasury, IRS Pub. 438, October 1973.

Statistics on Income 1970: Corporate Income Tax Returns, Dept. of Treasury, IRS Pub. 16, April 1974.

Table 10

COMPARISON OF INCOME AND BALANCE SHEET STATEMENTS
FOR AVERAGE BUSINESSES BY MAJOR SECTOR
(All money figures in thousands of dollars)

	All Businesses	Agriculture	Mining	Manu-facturing	Contract Construction	Public Utilities	Wholesale Trade	Retail Trade	Financial	Services
Total Receipts	$170	$19	$250	$1,737	$134	$374	$564	$169	$ 154	$ 44
Total Expenditures	160	15	225	1,661	128	356	545	162	140	36
Merchandise	74	2	25	788	51	59	434	108	24	3
Salaries and wages	36	3	75	385	37	105	55	27	21	23
Materials and supplies	18	5	38	249	23	68	13	9	13	1
Interest	7	1	13	29	2	21	6	3	31	1
Depreciation	7	2	37	68	5	37	6	3	6	1
Taxes	5	1	12	56	3	29	9	3	8	1
Employee benefits	5	0	13	54	5	16	9	4	4	3
Rent	3	1	0	20	1	10	6	4	5	2
Other (insurance, etc.)	5	1	12	12	1	11	6	1	28	0
Profits	10	4	25	76	6	18	19	7	14	8
(Cash	42	6	52	132	11	37	26	9	332	7
a(Accounts Receivable	51	4	57	183	17	41	64	13	366	6
(Inventory	17	5	9	183	9	6	64	23	2	1
Fixed Assets	75	40	214	403	25	224	55	26	322	38
Total Assets	185	55	332	901	62	308	209	71	1,022	52
b(Accounts Payable	38	9	90	250	24	68	81	23	122	14
(Other Current Liabilities	53	1	19	69	6	15	12	4	470	3
Long-Term Debt	39	16	60	117	9	102	23	10	215	23
Net Worth	55	29	163	465	23	123	93	34	215	12
(a/b) Current Ratio	1.2	1.5	1.1	1.6	1.2	1.0	1.7	1.7	1.2	0.8
Inventory turnover	5.4	n.m	n.m	5.7	n.m	n.m	7.0	5.1	n.m	4.0
Sales to Assets	0.92	0.35	0.75	1.74	2.18	1.22	2.70	2.38	0.15	0.85
Profits to Net Worth	0.18	0.14	0.15	0.16	0.26	0.15	0.20	0.21	0.07	0.67
Assets to Net Worth	0.30	0.53	0.49	0.52	0.37	0.40	0.44	0.48	0.21	0.23

Sources: Statistics on Income 1970: Business Income Tax Returns, Dept. of Treasury, IRS Pub. 438, October 1973.

Statistics on Income 1970: Corporate Income Tax Returns, Dept. of Treasury, IRS Pub. 16, April 1974.

only slightly greater than its accounts payable and other current liabilities (i.e., the current ratio). These considerations suggest that businesses with those characteristics might easily be placed in a loss position for a year by any extended period of disruption of the activities.

The current ratios are among those measures commonly used to evaluate qualifications of a business for investment or credit purposes. While appropriate operating ratios are highly variable, a common rule of thumb establishes a minimum current ratio of 2. At this level, none of the average businesses characterized in Table 10 would meet the criterion. In brief, the financial statements and the current ratios indicate that none of the average businesses would qualify for investment or credit in the national money markets. These sources of capital are generally reserved for large corporations.

A pattern of financing, however, does exist that indicates a strong interdependence between businesses. Inventories and receivables tend to be financed by accounts payable and other liabilities. There is a logical chain of credit extended to finance sales from manufacturer to wholesaler to retailer to consumer. At each step the average seller tends to be larger than the average buyer. The accounts receivable of the very large, well-capitalized, and profitable businesses are ultimately dependent on revenues from the many small, marginal businesses. Thus, the viability of even the economically strong companies could be put in jeopardy by failure of many smaller firms.

The net worth of the smaller businesses tends to represent the personal savings (capital) of the proprietor. Along with long term debt (such as real estate mortgages), this equity appears to be closely related to the valuation of fixed assets (reported net of depreciation). It is the nature of fixed assets that they retain value only in the context of ongoing business operations. Seldom do liquidation sales yield a substantial portion of book value of fixed assets. Should a business be faced with a situation that would peril its operations and the value of its fixed assets (let alone its inventories), the peril would reflect immediately to the net worth. For the small proprietor or partner, losses to net worth would include his personal capital and savings.

The size of businesses appears to correlate to their financial conditions, with larger businesses being generally healthier. This observation is important to an appreciation of the financial vulnerability of businesses when it is realized that over 90% of all businesses are smaller (in terms of revenues) than the "average" given in Table 10. Service businesses tend to be smaller than businesses in other industrial sectors (except agriculture). Comparison of the financial condition of the average service business with all businesses reveals a low current ratio and a weak net worth position.

Crisis relocation would face many businesses with critical problems in addition to ongoing business concerns. Because of the wide variations and conditions of the many businesses, a wide variation of responses would be expected. The responses would be sensitive both to the development of the crisis events and to government policies. Obviously, host area businesses and the larger, better integrated businesses would have more flexibility in accommodating to crisis relocation than the smaller, fixed location businesses in risk areas. The designation of essential vs. non-essential industries in the risk areas would introduce another variation.

Three major categories of business operations would be particularly critical during crisis relocation:

- o Production and inventories
- o Finance
- o Employment.

The problems may be significantly different during the Pre-CR Crisis, CR-Initiation, CR-Maintenance, and CR-Reconstitution Phases. Table 11 summarizes these potential problems and indicates their economic consequences.

B. Business in the Pre-CR Crisis Phase

The crisis period may be considered to start when businessmen actively comprehend that relocation and nuclear destruction are real, high-probability events. Earlier studies[12] indicate that this acceptance can come quickly and be widespread, based on a critical change in the environment. Obviously, great uncertainty would surround such decisions as to the occurrence and timing of relocation and attack. Should the period be very short, there

Table 11

POTENTIAL IMPACT OF CRISIS RELOCATION ON BUSINESS
BY TIME PHASES

Business Function	Business Response	Impact of Business Response
Pre-CR Crisis Phase		
Production and inventories	o Shutdown of production (risk areas) o Liquidation of inventories (risk areas)	o Loss of goods to economy o Disruption of distribution channels
Finance	o Deferred payment of current accounts and expenses o Cash withdrawals from banks o High sales of merchandise	o Disruption of money and capital markets o Large cash holdings o Revised price structure
Employment	o Increased absenteeism o Increased unemployment	o Loss of efficiency and production o Long term loss of purchasing power
CR-Initiation Phase	o General shutdown of all business o Freeze of assets and payments	o Loss of goods and services to economy o Distribution hiatus o Problems of security of assets
CR-Maintenance Phase		
Production and inventories	o High demands on essential and host area businesses o Shutdown of other risk area businesses	o Loss of goods and services to economy o Revised production and distribution subject to loss of controls and inefficiencies o Developing imbalances
Finance	o Suspended payments of risk area business accounts o Flow of cash and assets to host area businesses	o Disruption of current asset position of many businesses o Dissipation of liquid business assets
Employment	o Imbalanced skill requirements o High unemployment	o Loss of efficiency and production o Loss and imbalance of purchasing power

Table 11 (concluded)

Business Function	Business Response	Impact of Business Response
CR-Reconstitution Phase		
Production & inventories	o Need to rebuild work-in-process, distribution, and inventories	o Continued shortages of consumer goods o Imbalance of distribution
Finance	o Revision of asset values o Curtailed ability to meet current expenses o Curtailed ability to finance rebuilding of inventories	o Possible high bankruptcy rate o Inability to collect current accounts o Losses of asset value
Employment	o Slow pickup as pipelines refill o Permanent dislocations from business failures and worker relocations	o Loss of productivity and inefficiencies due to labor force imbalances o Permanent losses of purchasing power

would be little that risk area businesses could do except to secure their inventories and fixed assets, lock their doors, and depart. Many businessmen would be reluctant to take this step.

If the crisis time period were of sufficient duration, risk area businesses would tend to activate shutdown procedures. The steel makers, cement makers, chemical manufacturers, and others with long leadtime process operations would use the time for orderly shutdown. However, all manufacturers would have similar problems in deciding the degree to which they should work out their goods-in-process inventories. In 1974, manufacturers' inventories represented 2.07 months of durables and 1.20 months of non-durables in terms of average monthly sales[1*]. There might be a tendency for manufacturers to attempt to ship as much material and merchandise as possible in order to avoid loss in case of war and to optimize his financial position. While it would be desirable to have these shipments made to customers outside of risk areas, many manufacturers would not have that option. Other manufacturers might withhold inventories in expectation of a future scarcity or increased value.

Similarly, retailers and wholesalers would be under pressure to liquidate their inventories. Retailers at the end of the year show an average of 1.8 months' supply of durables and 1.06 months' supply of non-durables relative to average monthly sales[1†]. Wholesalers at the end of the year show about 1.5 months' supply of durables and 0.9 months' supply of non-durables[1**]. Those with rapidly moving stocks, such as food, could be expected to sell out rapidly. Those with slower moving merchandise--for example, pianos--might have a very hard time moving their inventories at any price. This tendency toward inventory liquidation would be complicated by incoming shipments from businesses further up the pipeline.

Host area businesses would be subject to heavy shipments of merchandise to the extent that they were able, and found it desirable, to make the inventory commitments. It is apparent that the Pre-CR Crisis Phase would be a period of high uncertainty and dislocation of the normal flow of merchandise, accelerated by breakdowns of transportation and communications in the final

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*Table 1252, Statistical Abstracts.
†Table 1312, Statistical Abstracts.
**Table 1321, Statistical Abstracts.

stages of the pre-CR Crisis Phase. This condition would result in loss of production and services, and disruption of distribution channels and normal product pricing.

Working capital and cash flow decisions would be closely related to work-in-process and inventory decisions. During the pre-CR Crisis Phase, each business would have to make decisions regarding bank and other loan sources, bank withdrawals, and conversions of assets to cash. As indicated in Table 10, for the average of all businesses, current accounts are roughly in balance, with cash and accounts receivable approximately equal to accounts payable and other current liabilities. However, there is a vast disparity between individual businesses. During this time, particularly if normal communications started to break down, there would be a strong tendency to defer payments (and hence, collections) of current accounts. Also, many businesses would probably find it highly desirable to defer payments of their other business expenses--wages, interest, rents, and the like--to enhance their liquidity and flexibility.

Labor expense is a major ingredient in all business activities. For manufacturing in 1972, labor costs were about 30% of manufacturing value added [1*]. The pre-CR Crisis Phase would be marked by a high level of absenteeism as workers decided, for personal and family security reasons, to leave risk areas. Involuntary unemployment also would become a major factor as businesses moved to close down operations and improve their liquidity. It is apparent that there would be excess labor force in the host areas; it is not clear that these workers would be rapidly absorbed by ongoing business activities. Business problems of this phase suggest the following measures:

- Provision of means of insuring and protecting risk area business facilities, equipment, and inventories to prevent undesirable liquidation.
- Public information efforts to restrain premature shutdown of businesses.
- Provision of controlled access by business to liquid assets and credit needed for maintaining operations.
- Development of plans by business for operations during crisis.

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*Table 1253, Statistical Abstracts.

C. Business in the CR-Initiation Phase

On the initiation of crisis relocation, it may be expected that all normal business functions would come to a standstill. While this time frame might be relatively short, it would be marked by a breakdown of communications; confusion involving deliveries of goods-in-transit; necessity to secure fixed assets and remaining inventories; and the preservation of non-durable goods. There would also be pressures to obtain cash monies, both to pay relocation expenses and to secure businessmen from war-caused loss.

The CR-Initiation Phase would be marked by the movement of all people from risk to host areas. Workers would be part of this movement and would be primarily concerned with their families and personal assets. Consequently, businesses would experience difficulties in achieving orderly operation or shutdown. Depending on the industry, shutdown could require hours to weeks. Generally, only a small fraction of the work force would be required in any given facility. However, key skilled workers may be essential for this purpose.

These considerations suggest the following:

- o Development of plans by risk area business for orderly shutdown in response to crisis relocation.
- o Development of plans for continued operation of essential business in the risk or host areas.

D. Business in the CR-Maintenance Phase

The CR-Maintenance Phase would result in low business activity in the risk areas and high business activity in the host areas. In the early stages of the maintenance period, people in the host areas would be supplied with goods from the various distribution pipelines, and these goods would be redirected from risk area to host area outlets. Because many management and control functions are housed in the risk areas, there could be significant confusion and disruptions in this process. About 90% of central management employees and 95% of corporate headquarters are located in metropolitan areas.[13] Redirected priorities of transportation, communications, and utilities services would add to this disruption. The problems would be aggravated by the

continuing operations of businesses in risk and host areas because of their needs for labor and for supportive services from businesses which might have been closed down. It would not be uncommon for host area industry to depend on urban area banks for payroll, billing, and other services. To the extent that these operating businesses could not maintain themselves on their on-hand inventories, they would be faced with immediate dislocation.

Should the CR-Maintenance Phase continue over an extended period (two weeks or longer), the flow of goods from the pipelines might suffer severe imbalances for both host area and essential risk area business. A natural consequence of these shortages would be an increasing pressure to free the remaining inventories of non-essential risk area businesses and to resume production on an ever-widening scope. This readjustment might be disrupted by an imbalance of availability of the business managers; some would be eager to return to the risk areas to resume their activities; some would be reluctant to return and be employed in activities in host areas; others might be beyond communication. While a general authority might permit acquisition of required goods from closed businesses, such a policy would be difficult because of problems in locating proper materials, and would be inefficient because of the waste that would accompany any such action.

Problems of finance and cash monies would be severe during the CR-Maintenance Phase. If the monetary system continues functioning during this phase, over time, available monies can be expected to flow to host area businesses. However, the apparent benefits to host area businesses would be tempered by shortages of merchandise, by credit limitations, and by a reluctance to build inventories and expand operations in the face of a very uncertain future.

During the maintenance period, there would be a general surplus of labor in the host area, marked by shortages of selected skills. While some of this labor would be absorbed in building shelters and serving the risk area population needs, considerable unemployment would remain. About seventy-three percent of the work force is in urban areas[8], so that even allowing 10% for key workers and 50% expansion of work force in non-risk areas would leave over half of the work force unemployed.

C. Business in the CR-Initiation Phase

On the initiation of crisis relocation, it may be expected that all normal business functions would come to a standstill. While this time frame might be relatively short, it would be marked by a breakdown of communications; confusion involving deliveries of goods-in-transit; necessity to secure fixed assets and remaining inventories; and the preservation of non-durable goods. There would also be pressures to obtain cash monies, both to pay relocation expenses and to secure businessmen from war-caused loss.

The CR-Initiation Phase would be marked by the movement of all people from risk to host areas. Workers would be part of this movement and would be primarily concerned with their families and personal assets. Consequently, businesses would experience difficulties in achieving orderly operation or shutdown. Depending on the industry, shutdown could require hours to weeks. Generally, only a small fraction of the work force would be required in any given facility. However, key skilled workers may be essential for this purpose.

These considerations suggest the following:

- o Development of plans by risk area business for orderly shutdown in response to crisis relocation.
- o Development of plans for continued operation of essential business in the risk or host areas.

D. Business in the CR-Maintenance Phase

The CR-Maintenance Phase would result in low business activity in the risk areas and high business activity in the host areas. In the early stages of the maintenance period, people in the host areas would be supplied with goods from the various distribution pipelines, and these goods would be redirected from risk area to host area outlets. Because many management and control functions are housed in the risk areas, there could be significant confusion and disruptions in this process. About 90% of central management employees and 95% of corporate headquarters are located in metropolitan areas.[13] Redirected priorities of transportation, communications, and utilities services would add to this disruption. The problems would be aggravated by the

It is questionable whether host area businesses would be willing to vastly expand their employment for the uncertain period. Reasons for this reluctance include problems of the paperwork, liability, cash flow, union agreements, safety, security, and personnel problems of employers. These considerations suggest the following measures:

- o Development of plans and policies for operation of host area business during the CR-Maintenance Phase.
- o Development of plans to provide essential supportive services to operating host and risk area business.
- o Provision of access to liquid assets and credit needed for maintaining business.
- o Development of emergency procedures and guidelines for temporary expansion of business labor force.

E. Business in the CR-Reconstitution Phase

During this phase, producers would have to reopen their facilities, re-establish their production processes, build up their goods-in-process inventories, and attempt to re-establish their distribution channels. At the wholesale and retail levels, inventories would have to be rebuilt and stores restocked.

To the extent that businesses have liquidated their assets, it might be expected that significant amounts of capital would have been consumed during the CR-Maintenance Phase. This situation would result in a deterioration of the working capital position for many risk area businesses, in addition to the loss of real goods and services during the CR-Maintenance Phase. Moreover, there might be a significant change in the valuation of land and fixed assets as a result of the war crisis, thereby eroding the net worth position. There would also be a severe cash flow problem during the reopening and inventory building period. Expenses would be high and revenues from sales low. Demand for products and services in many economic sectors would probably be depressed because of the reduced purchasing power of the consumers.

The dislocation of the labor force by crisis relocation could make many people reluctant to expose themselves a second time to the hazards of war and relocation. Skilled workers would have the most advantages in

finding permanent positions, leaving risk area businesses short of experienced personnel.

During the CR-Reconstitution Phase, the already tenuous financial situation of many businesses would be accentuated. Most creditors might be lenient with their debtors, because of the need to retain them as customers, clients, and interest payers. However, each business would also need to collect its accounts receivable to maintain its own viability. Cash normally held by business is much less than current expenses (i.e., accounts payable, and other current liabilities). For business in general, Table 10 shows that cash holdings represent only 46% of current expenses, and wholesale and retail sectors represent 28% and 33%, respectively[14,15]. Thus, a slowdown in sales and accounts receivable would quickly be translated into a widespread demand for short term credit. Without this credit and other assistance, there could be a vast increase in the number of voluntary as well as involuntary bankruptcies. They would initially be concentrated among small risk area businesses, but could possibly spread to larger businesses through the loss of customers, accounts receivable, and production.

The normal effect of bankruptcies is to initiate a protracted period of litigation, with the assets of the bankrupt company frozen. Should the courts become overloaded with such cases, such a freeze might produce a domino effect on otherwise viable companies. They would find their accounts receivable frozen and their accounts payable subject to court-ordered acceleration. Widespread bankruptcies would have a severe negative impact upon employment, consumption, and the financial structure of the economy. These considerations suggest the following measures:

- Provision of adequate credit to risk area business in order to allow re-establishment of production processing, inventories, etc.
- Credit to allow for immediate payment of accrued earnings and benefits of employees, and accounts payable.
- Provision of means to prevent penalties and legal problems growing out of inability of business to make prompt payments on overdue obligations.

Economic Impact of Crisis Relocation on Financial Institutions

A. General Economic Characteristics

Financial institutions include all those financial intermediaries that facilitate the flow of funds between producers and consumers, employers and employees, government and the private sector, other individuals, groups, and agencies, as well as nations. Financial intermediaries have taken many forms to meet the various needs of the U.S. economic system. Under the general category of banking institutions are included: commercial banks, trust companies, private banks, savings banks, mutual savings banks, savings and loan associations, building and loan associations, cooperative banks, homestead associations, credit unions, U.S. postal depository offices, and Federal Home Loan Banks. Other financial intermediaries include insurance companies, credit purchase lenders, factoring companies, etc. To provide for the proper functioning of the financial system and the safety of funds of depositors and investors, financial institutions are subjected to regulation by various federal and state agencies including: Federal Reserve System, Federal Deposit Insurance Corporation, Federal Home Loan Bank Board, Comptroller of the Currency and state banking departments.

Financial institutions provide a range of services that are vital to the day-to-day functioning of the economic system. Primary among these are: loans to allow the expansion of production of goods and services; other forms of credit to enhance the liquidity and the current purchasing power of economic units; convenient and profit producing repositories for money and other assets; convenient and safe means for completing transfers of funds (e.g., checking systems); and a variety of other services such as payroll, billing, underwriting, insuring, etc. Without these various financial institutions, an effective and efficient credit market would not exist.

The uses and sources of credit market funds by the non-financial sectors are shown in Table 12 for the years 1966, 1970, and 1974. A comparison of statistics for the three years illustrates the rapid expansion of credit over the nine-year time span, as well as the change in the relative levels of funding from the various sources. As shown in the table, an appreciable increase in funds available from the various sources is necessary to provide the credit needed to sustain the economy. A reversal of the basic rise in funding levels would cause severe credit allocation problems.

Table 12

TOTAL FUNDS RAISED IN CREDIT MARKET: NONFINANCIAL SECTORS

	1966		1970		1974	
	Amount	Percent	Amount	Percent	Amount	Percent
Funds Raised						
U.S. Government	$ 3.6	5.3%	$12.8	13.0%	$ 12.0	6.7%
Foreign	1.5	2.2	2.7	2.8	15.4	8.6
State and Local Governments	6.3	9.2	11.3	11.5	16.6	9.2
Households	22.7	33.4	23.4	23.8	44.0	24.4
Corporate	25.3	37.3	39.5	40.2	77.1	42.8
Farm	3.1	4.6	3.2	3.2	7.8	4.3
Others	5.4	8.0	5.3	5.4	7.2	4.0
Total	$67.9	100.0	$98.2	100.0	$180.1	100.0
Source of Funds						
Demand Deposits and Currency	$ 4.1	6.0%	$10.5	10.7%	$ 6.8	3.8%
Time and Savings Accounts	20.3	29.9	56.1	57.1	71.9	39.9
Insurance and Pension Reserves	18.1	26.7	21.8	22.2	36.1	20.0
U.S. Government Securities	8.4	12.4	-9.0	-9.2	18.1	10.0
Credit Market Instruments	9.2	13.5	6.5	6.7	13.7	7.6
Corporate Equity	-.9	-1.3	-1.7	-1.7	-1.0	-.6
Security Debt Reduction	.2	.3	.9	.9	1.8	1.0
Foreign Funds	1.8	2.7	2.4	2.4	25.7	14.3
U.S. Government Transactions and Loans	4.5	6.7	5.6	5.7	2.8	1.6
Other	2.2	3.2	5.1	5.2	4.2	2.3
Total	$67.9	100.0	$98.2	100.0	$180.1	100.0

Note: Percentages may not total 100.0 because of rounding.

Source: Economic Report of the President, various years.

Over the period shown, the total funds raised in the credit market increased from $67.9 billion to $180.1 billion, an increase of 265%. The corporate sector raises the largest share of the funds. Its relative share increased from 37.3% in 1966 to 42.8% of the funds raised in 1974. The household sector raises the second largest share (24.4%), but the relative share has significantly decreased over the nine-year period. The share of funds raised by state and local governments has remained relatively constant over the period. The share of the funds raised by the U.S. government was 13% in 1970, but was reduced to 6.7% in 1974. Foreign funds represent the greatest increase in relative terms [16].

Time and savings accounts represent the largest source of funds in Table 12. Over the nine-year period, these funds rose from about $20 billion to about $72 billion. For the year 1970, these funds accounted for 57% of the total available funds, the largest percentage share for the three years shown. For the period shown, about 70% of time and savings accounts were in commercial banks, and 30% were in savings institutions. Private insurance and pension reserves represented the second largest source of funds. These funds doubled over the nine-year span, although their relative share decreased. Funds available from foreigners showed the greatest relative increase--from about $2.0 billion in 1966 to almost $26 billion in 1974.

A substantial increase in the demand for credit funds as well as a reduction in supply of credit funds could be anticipated in the aftermath of crisis relocation. Consequently, an examination is required of normal sources of such funds.

As already indicated, commercial banks and savings institutions represent the largest source of funds for the credit market. Their ability to provide these funds depends primarily on the continual inflow of deposits which is necessary in order to support an expanding economy. Table 13 summarizes the principal assets and liabilities of all commercial banks for 1965, 1970, and 1975.

As seen in Table 13, total assets(and hence liabilities and net worth) have increased during the nine years from $377 billion to $965 billion. During this period, loans have also increased to $546 billion--270%. The

Table 13

PRINCIPAL ASSETS AND LIABILITIES, ALL COMMERCIAL BANKS

(Year End, Billions of Dollars)

Assets	1965	1970	1975
Cash/balances/collections	$ 60.9	$ 93.6	$133.6
Securities:			
U.S. Government	59.5	61.7	84.1
Others	44.9	86.1	145.5
Loans	201.7	313.3	546.4
Other Assets	10.3	21.5	55.6
Total	$377.3	$576.2	$965.2

Liabilities and Net Worth	1965	1970	1975
Demand Deposits	$184.7	$247.8	$323.6
Time and Savings Deposits	147.7	233.1	462.6
Borrowings	4.5	19.4	60.4
Other Liabilities	10.1	32.9	49.5
Capital Accounts	30.3	43.0	69.1
Total	$377.3	$576.2	$965.2

Other Indicators	1965	1970	1975
Number of Banks	13,804	13,686	14,633

Source: Federal Reserve Bulletin, August 1966, and July 1976.

expansion of loans was made possible through the increased demand, time, and savings deposits. Total deposits increased over the period by 237% to $786 billion. In addition to loans, other earning assets are represented by securities and other investments, which increased in the period from $104 billion to $230 billion.

Crisis relocation and its aftermath could place the liquidity and reserve position of the banking system in a precarious situation. The ability of banks to preserve their earning assets, especially loans, would depend on renewed deposits and reserve requirements.

As Table 14 shows, the total assets of savings and loan establishments have increased at about the same rate as those of commercial banks. The assets of savings and loan establishments primarily consist of mortgages, which make up 82% of total assets. Mortgages increased from $110 billion in 1965 to $279 billion in 1975, an expansion made possible by the increase in savings accounts. Because of these holdings, savings and loan establishments are particularly sensitive to slowdown in payments on outstanding mortgages or increases in defaults. This condition might require prompt government actions such as institution of a moratorium on outstanding obligations.

In Table 15, the position of all commercial banks and members of the Federal Reserve System is given. At year end 1975 about 40% of all commercial banks were members of the Federal Reserve System. Member banks account for 76% of the assets of all commercial banks, and have liquid assets that account for 15% of total assets.

Investments in securities by member banks represent 22% of total assets; federal, state, and local securities account for 84% of the securities investment. Loans account for 57% of total assets. About one-third are short-term loans (repayment in one year or less). Timely debt service on short-term loans is an important source of bank income and is particularly sensitive to the continued normal functioning of business. Among member banks, 26% of the liabilities plus net worth are in demand deposits, and time and savings deposits represent 46%.

A severe crisis and crisis relocation could result in a significant reduction in total deposits. Moreover, a significant fraction of earning assets, both investments and loans, could become questionable. The face value of investments would be depressed, and repayment of loans would be delayed. As indicated

Table 14

PRINCIPAL ASSETS AND LIABILITIES, SAVINGS AND LOAN ESTABLISHMENTS

(Year End, Billions of Dollars)

Assets	1965	1970	1975
Cash and Investments	$ 11.3	$ 16.6	$ 30.9
Mortgages	110.2	150.3	278.7
Other Assets	7.9	9.3	28.8
Total	$129.4	$176.2	$338.4

Liabilities and Net Worth	1965	1970	1975
Savings Accounts	$110.3	$146.4	$286.0
Borrowings/commitments	10.4	17.4	32.6
Capital Accounts	8.7	12.4	19.8
Total	$129.4	$176.2	$338.4

Source: Federal Reserve Bulletin, August 1966, and July 1976.

Table 15

ASSETS AND LIABILITIES, ALL COMMERCIAL BANKS, MEMBER BANKS

(1975 Year End, Billions of Dollars)

	All Banks[a/]	Member Banks[b/]
Assets		
Currency	$ 12.3	$ 9.2
Reserves, Federal Reserve Banks	26.8	26.8
Balances	47.2	27.0
In-process Collections	47.3	45.5
Subtotal	$133.6	$108.5
U.S. Treasury Securities	84.1	61.5
Municipal Securities	102.0	74.1
Other Securities	43.5	26.6
Subtotal	$229.6	$162.2
Real Estate Loans	134.8	96.0
Installment and Other Loans, Individual	106.4	75.5
Commercial and Industrial Loans	179.3	145.9
Loans to Financial Institutions	29.6	28.1
All Other Loans	96.3	71.0
Subtotal	$546.4	$416.5
Other Assets, including Fixed Assets	55.6	46.6
TOTAL	$965.2	$733.8
Liabilities and Net Worth		
Demand Deposits:		
Individual/partnership/corporation	$246.6	$187.6
Commercial Banks	33.8	32.0
State/Local Governments	18.7	13.1
All Others	24.5	18.9
Subtotal	$323.6	$251.6
Time and Savings Deposits:		
Savings Deposits	160.1	114.2
Other Individual/partnership/corporation	229.4	168.9
State/Local Governments	48.1	34.4
All Others	25.3	21.9
Subtotal	$462.9	$339.4

Table 15 (concluded)

	All Banks[a/]	Member Banks[b/]
Liabilities and Net Worth (Continued)		
Federal Funds Purchase/Security Repurchase	$ 53.8	$ 49.3
Other Indebtedness and Liabilities	46.8	34.0
Reserves Loans/Securities	9.0	7.3
Subtotal	$109.6	$ 90.6
Capital Account	69.1	52.1
TOTAL	$965.2	$733.8
Number of Banks	14,633	5,787

a/ Means all commercial banks

b/ Means Federal Reserve System member banks.

Source: Federal Reserve Bulletin, July 1976.

earlier, reserve positions could become precarious, and ability to make needed loans would be constrained. Bankruptcies among financial institutions could rise.

Although there are about 5,800 member banks, the assets are concentrated in a few banks. Table 16 summarizes selected data on 20 of the largest banks (ranked by deposits). These assets represent about 58% of the assets of all member banks. The 20 banks account for 58% of deposits as well as loans of all member banks, and 43 percent of deposits as well as loans of all commercial banks. All of these banks are headquartered in the major metropolitan centers. Their ability to transfer essential functions to branches, other banks, and relocation sites in host areas has been studied by cognizant government agencies (see, for example, reference 17).

Commercial banks that are members of the Federal Reserve System, as well as certain mutual savings banks, are required to maintain specified reserves with Federal Reserve Banks. For commercial banks, the reserve requirements depend on the size of the deposits and on the location of the bank. At present, the legal limits on reserve requirements range from 7 to 22% for demand deposits and from 3 to 10% for time deposits.

In the CR-Reconstitution Phase, reserve requirements might have to be carefully and perhaps selectively set in order to assist in the transition to normal operations.

In addition to conventional lending operations, financial institutions provide a range of other essential services including:

- o Preparation of payrolls for large corporations and public agencies.
- o Billing for utilities and insurance companies.
- o Provision of insurance and operation of pension and annuity systems.
- o Acceptance of tax payments for the federal government.
- o Underwriting and transfer of securities.
- o Factoring.*

*Factoring is the purchase of accounts receivable at a discount.

Table 16

SELECTED DATA: TWENTY LARGEST BANKS RANKED BY DEPOSITS

(1975 Year End, Millions of Dollars)

	BANK	TOTAL DEPOSITS	TOTAL ASSETS	TOTAL LOANS OUTSTANDING	NET AVERAGE FED. FUNDS BORROWED (% OF AVG. LOANS)	NET OPERATING INCOME	SHAREHOLDER EQUITY AS % OF ASSETS
1	BankAmerica (San Francisco)	56,545	66,763	33,386	3(a)	302	3.0
2	Citicorp (New York	44,682	57,850	36,632	5(b)	348	4.1
3	Chase Manhattan (New York)	33,928	41,414	28,832	8	157	3.9
4	Manufacturers Hanover (New York	23,471	28,291	16,066	5	136	3.5
5	Morgan (J.P.) (New York)	19,939	25,832	13,223	16(d)	192	4.7
6	Chemical New York	19,392	23,771	13,589	11(b)	99	3.5
7	Bankers Trust New York	16,945	20,611	11,167	14(b)	64	3.4
8	Continental Illinois (Chicago)	15,300	20,226	12,154	11	119	4.1
9	Western Bancorp. (Los Angeles)	15,119	18,713	10,281	6	78	4.3
10	First Chicago	14,193	19,012	11,897	12	106	4.7
11	Security Pacific (Los Angeles)	12,199	14,874	8,610	11(d)	65	4.4
12	Charter New York	9,861	11,107	5,083	12(d)	45	3.3
13	Wells Fargo (San Francisco)	9,824	12,362	7,620	10(b)	56	4.0
14	Marine Midland Banks (Buffalo)	9,568	11,104	6,368	9(b)	16	3.8
15	Crocker National (San Francisco)	8,845	10,449	6,137	4(a)	40	4.0
16	Mellon National (Pittsburgh)	7,008	9,018	4,617	4	64	7.0
17	First National Boston	6,543	8,614	4,263	10	42	5.8
18	Northwest Bancorp. (Minneapolis)	6,094	7,387	4,268	5	58	6.0
19	National Detroit	5,945	7,347	3,606	11	54	5.9
20	First Bank System (Minneapolis)	5,650	7,173	4,203	9(a)	62	6.6
	Total	341,051	421,918	242,002		2,103	

(a) Year-end Amounts; (b) Loans are net of unearned income; (c) Loans are net of valuation portion of loan loss reserve; (d) Loans are net of unearned income and valuation portion of loan loss reserve; (e) Data are for banking operations only; NA not available; NM, not meaningful. (Data: Investors Management Sciences, Inc.)

During crisis relocation, many of these financial functions would be reduced or would cease altogether. The pace of recovery in the CR-Reconstitution Phase would depend importantly on the ability of financial institutions to re-assume these functions in a timely and efficient manner.

The profitability, and indeed the solvency, of financial institutions depend upon the health of the nation's economy. Factors having an impact on the profitability of financial institutions include the following:

(1) For commercial or farm short term loans, the loans are generally structured so as to be self-liquidating, usually on sale of inventories or crops, or on the payment of accounts receivable. Delay in these sources of income to businesses or farmers would in turn delay payment of the loans and limit the ability of banks to make new loans. Calls on loans could force a variety of actions by the affected party, including liquidating assets or drawing down demand deposits earmarked for other purposes.

(2) Delay in repayment of short term loans incurred by individuals would generally have the same consequence as described under (1) above.

(3) Under adverse economic circumstances, the number of questionable loans, whether short or long term, increases. While banks would tend to avoid wholesale calling of loans or foreclosure, loss of regular repayment would affect the liquidity of financial institutions. Solvency might also be threatened by a change in the value of securities held by a bank. Writing down of the book value of securities could place a bank in an undercapitalized position, requiring state or federal government action. Recent financial difficulties in municipalities such as New York City and in business such as real estate investment trusts have placed significant strains on many banks. When the ratio of questionable loans or investments to capital account reaches 65%, a bank is placed in a potential problem category by the U.S. Comptroller of Currency[18]. In the recent past, the average ratio for the several banks reached 101.9%[19]. Table 17 indicates the extent of questionable loans and investments of the 12 large New York City banks. For these banks, questionable items exceed equity capital and loan loss reserves. Moreover, the dependence of commercial banks on the continued financial health of government agencies is indicated by the fact that the value of these banks' holdings of municipal obligations exceeds the sum of equity capital and loan loss reserves.

Table 17

SELECTED DATA ON LOAN PORTFOLIOS
(Billions of Dollars)

	12 Large New York City Banks	All Commercial Banks
Loan or Investment		
Total municipal holdings.....	$8.0	$100.4
New York City and Municipal Assistance Corp. paper.....	2.0	NA
New York State paper.....	1.5	NA
Unguaranteed real estate loans.....	7.6	123.8
Real estate investment trust loans.....	4.0	12.0
Airline loans.....	1.0	1.9
W.T. Grant loans.....	0.4	0.7
Equity capital.....	9.5	61.4
Loan loss reserves.....	1.8	9.5

NA: not available

Source: Business Week, Oct. 20, 1975, based on information from Federal Reserve Board, Salomon Brothers, and Drexel Burnham.

(4) The check clearing system is dependent upon highly automated check processing facilities at major banks, clearing houses, and Federal Reserve offices which are usually located in major metropolitan areas. Just one bank -- First National City Bank -- processes over 3 million checks per day[20]. In spite of these facilities, the banking system has been hard pressed to increase capacity at a rate sufficient to keep up with the constantly increasing use of checks. Depending upon location and the level of activity in the system, the period required to clear checks can be from one to several days. During this period, the float of in-process collection is available for use by the various banks or depositors*. Consequently, banks have the use of these funds for short term loans, balancing reserve positions, etc. The total float in commercial banks was estimated as of December 1975 to be $47 billion, which was equivalent to 15% of the demand deposits at the same period†. Any event that would increase the time required to clear checks could have a significant effect on the float and thus upon the credit market.

Crisis relocation imposes further stress on financial institutions. The additional stresses include the following:

(1) Commercial banks are heavily involved in the operation and financial support of credit card systems. Major systems are operated by consortiums of banks (e.g., Master Charge) and licensed users (BankAmericard). The systems are organized so that the merchants forward bills (in one to three days) to the individual bank with which they have credit card arrangements, and receive "immediate" credit for the sales less any agreed-upon discount[21]. The total amount of outstanding credit from banks on credit cards in 1970 was $4.5 billion and in 1974 was $8.3 billion. In 1974 this represented 24% of non-installment credit and 4% of all credit outstanding[1]**. A large increase in the use of credit cards during crisis could curtail allocation flexibility on the short term funds available to banks. Also, unless controls were maintained at the point of purchase, banks would have no method of assuring that the new credit was being used for only essential items. Moreover, a slowdown of this service during crisis would temporarily deprive merchants of such credits, which play an important part in providing business with operating funds.

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*Float can be viewed as two credit balances representing the same funds. The Bankers, p. 137, M. Meyer, Ballantine Books, New York, N.Y., 1974, quoting Russell Fenwick of Bank of America.

†See Table 15, Statistical Abstracts.

**Table 771, Statistical Abstracts.

(2) Banking institutions also face liquidity problems in their balance of payments transactions. As of year end 1975, banks reported that short term liabilities to foreigners totalled $94.1 billion while short term claims on foreigners totalled $49.9 billion. Concurrently, long term liabilities to foreigners totalled $1.8 billion while long term claims on foreigners totalled $9.5 billion[22]. Any event resulting in increased demands for prompt payment and transfer of funds to foreigners would adversely affect the reserve position of the banking system.

(3) Commercial banks often act as repositories for the receipt of income tax and social security payments due the federal government. Balances are generally left in the accounts for periods of a week or more before being called by the federal government. Money in these accounts is one source of short term funds for use by banks. Crisis relocation would cause a change in the total quantity and the distribution of such funds among banks. The availability of such funds upon demand may present problems.

(4) Systems for handling payroll and billing for large corporations and public agencies are highly automated and are largely centralized in major metropolitan and economic regional centers. Closure of these centrally located facilities would affect the ability to perform these functions for both risk and non-risk area business. Essential industry in the risk areas and businesses in the non-risk areas would have difficulty in determining accrued wages of employees and in preparing checks to cover such earnings during the crisis relocation period. Accounts receivable might not be billable during the crisis and might be subject to considerable further delays after the crisis until backlogs could be reduced.

(5) Establishments dealing in factoring would be subject to especially heavy losses. Discounts, which represent profits and costs of factoring, are dependent upon an anticipated timely payment of accounts receivable. A considerable delay of payments by a large fraction of business such as might accompany a crisis, would quickly wipe out the margins of such firms.

(6) Banks prefer to avoid the forced conversion of earning assets into liquid assets to meet reserve requirements. Borrowing from other banks using top-quality loans (bankers' acceptances, loans endorsed by other banks) is a normal method for preserving reserve positions as collateral. In addition, banks borrow funds from other banks to meet day-to-day reserve requirements (i.e., federal funds).

The ability to continue these practices in a crisis situation can be severely limited, since the crisis situation could degrade simultaneously the reserve positions of nearly all major banks. This condition could be ameliorated by prompt availability of funds through the discount window of Federal Reserve Banks in relocated sites.

Financial institutions would face severe problems in a crisis relocation situation. Plans for the orderly preservation of reserve positions would be essential. Unless the impact on reserves could be controlled, the disruption of the nation's economy could be severe. Table 18 summarizes some of the major problems facing financial institutions and indicates likely consequences.

B. Financial Institutions in the Pre-CR Crisis Phase

The extent and intensity of events preceding the decision to initiate the relocation of the population are of the utmost importance in analyzing the impact of the consequences on financial institutions. If there is an escalation of the crisis over an extended period of time without relocation, some (sizeable) proportion of the population might elect to leave areas perceived to be at risk. During this period, the impact on absenteeism, productivity, securities, commodities, and options markets, and deposit withdrawals probably could become severe, adversely affecting the solvency of many financial institutions.

The length of the PRE-CR Crisis Phase would affect the various economic sectors differently. Individuals and businesses could be using this time to achieve an orderly transition by protecting their interests, possibly with an adverse impact on the financial institutions. If, on the other hand, the Pre-CR Crisis Phase were short, the individuals and businesses would probably be less able to achieve orderly transitions; however, the impact on financial institutions could be reduced (e.g., fewer withdrawals and a relatively healthy reserve position).

Deposit withdrawals by individuals during an extended Pre-CR Crisis Phase could have a significant effect on the condition of banks. As shown in Table 15 previously, individuals, partnerships, and corporations have $188 billion in demand deposits and $283 billion in time and savings deposits in Federal Reserve member banks. (While not all member banks are in risk areas, the majority of these banks as well as their assets and liabilities are). As a lower bound on the impact

Table 18

POTENTIAL IMPACT OF CRISIS RELOCATION ON FINANCIAL INSTITUTIONS

Financial Function	Institutions Problems	Impact of Problems
Pre-CR Crisis Phase		
Check Clearing	o Increase in employee absenteeism o Increase in time to clear checks	o Unplanned increase in money supply
Deposit Withdrawals	o Increased withdrawals from demand, time, and savings deposits o Possible curtailment of automatic deposits	o Curtailment of new loan commitments, especially long term commitments o Difficulties in finding liquid assets to meet withdrawals o Curtailed availability of funds for interbank borrowing o Adverse effect on earnings
Earning Assets Management	o Reduced willingness to make loans o Increased delay in loan repayments o Erosion in value of securities held o Reluctance to call loans and forced disposal of securities	o Increased reliance on interbank borrowing to meet reserve requirements o Increased costs of borrowed funds o Limit to borrowing from the federal government
Other Services	o Increased delays in carrying out payroll, billing, credit card, and other functions o Increased inability to underwrite financing transactions	o Disruption of users' operations o Disruption of financing of new securities
CR-Initiation Phase	o Availability of computer check processing system o Availability of duplicate bank records o Determination of functions to be performed in risk areas o Desirability of closing down securities, commodities, and options markets o Safety of securities and facilities	o Promulgation of principles of loss equalizations o Implementation of Agent Bank plans o Unavoidable disruption of financial activities

Table 18 (Continued)

Financial Function	Institutions Problems	Impact of Problems
CR Maintenance Phase		
Check Clearing	o Control of cashing of checks in host areas o Verification of checks o Increase in time to clear checks o Acceptability of checks in host areas	o Unlikely profitability of banks o Increase in net borrowed reserves
Deposit Withdrawals	o Increased requirement for cash in host areas o Limitation on withdrawals for essential purposes o Curtailment of withdrawals by foreigners	o Implementation of measures similar to EB Reg. No. 1 o Uncertainty as to how reserves are balanced o Rationing of cash
Earning Assets Management	o Criteria for making essential short term loans o Inability to satisfy reserves through loan repayments or restructuring o Uncertain value of securities held o Curtailed ability to call loans	o Uncertain extent to which U.S. government securities can be sold o Less likelihood of continuation of interbank borrowing
Other Services	o Inability to provide payroll, billing, and other services o Control of credit card purchases o Cessation of underwriting functions	o Delay in completing transactions o Solvency of businesses and financial institutions

Table 18 (Concluded)

Financial Function	Institutions Problems	Impact of Problems
CR-Reconstitution Phase		
Check Clearing	o Orderly removal of control on cashing of checks o Resolution of bad checks issued o Orderly transfer to centralized check clearing o Record reconciliation	o Orderly return to the usual pre-crisis level of float
Deposit Withdrawals	o Encouragement of depositors o Determination of return on new time and savings deposits	o Maintenance of bank liquidity
Earning Assets Management	o Valuation of earning assets o Orderly phase-in of purchases of governmental and other securities o Restructuring of loans o Establishment of criteria for making new loans	o Phased reconstruction of credit market o Return to profitability o Loss equalization resulting from insolvency o Phase-in of normal security operations
Other Services	o Sorting out of records o Reconstitution of system of providing essential business functions o Reconstitution of securities, commodities, and options markets o Transfer of Agent Bank functions back to Federal Reserve	o Orderly phase-in of established services

of deposit withdrawals, suppose that 5 to 10 million families and 2 million individuals (9% to 18% of total families and 10% of individuals) decide to relocate temporarily for their own self-interests. Further suppose that families withdraw funds from deposits to cover average living needs for one month estimated at $1,225 (1975 dollars) equal to average monthly intermediate level budget[1*], whereas individuals withdraw funds to cover average living needs for two months. Over the crisis period, such withdrawals would total between about $8.0 billion and $15 billion, a sizeable but manageable reduction in commercial bank deposits.

As an upper bound estimate, suppose that individuals, partnerships, and corporations withdraw 10 to 15% of their total deposits. These withdrawals would range between $47 billion and $70 billion, representing about 75 to 110% of total liquid assets (excluding the float). Such withdrawals would make management of liquidity exceedingly difficult. The ability to obtain interbank loans to augment reserves would probably be curtailed. Open-market purchases of U.S. Treasury securities by the Federal Reserve System could release reserves to member banks. However, because of likely drop in security prices, including U.S. Treasury securities, coupled with selling of these securities on the part of all holders, the federal government might find it necessary to purchase an unduly large number of such securities.

Changing the reserve requirement downward could help relieve the pressure on banks to convert earning assets to preserve liquidity. Current regulations[23] permit the federal government to restrict cash withdrawals, transfers, and credit among other measures immediately after attack on the United States. Other proposed regulations[24] are under consideration that would allow the federal government to restrict cash withdrawals and credit in any major crisis situation.

Although the number of checks to be cleared is uncertain, banks probably would experience delays in the check-clearing process. The opportunity cost of such delays (measured in lost interest) could be significant. The interest foregone for a two-day delay in clearing $1 billion at 6% is almost $330,000. Delays in the clearing of checks would also have an adverse effect on bank earnings.

Earning assets management becomes an increasingly difficult task as the amounts withdrawn from deposits increase, assuming that the cash withdrawal is not redeposited in other banks. As an approximate indicator for the banking system, each dollar withdrawn is covered by reserves in the amount of 15 cents. If the ratio of required reserves remains unchanged, 85 cents has to be raised through borrowing either from other banks or from the federal government, through the repayment of outstanding loans or loan calls, or through the direct conversion of earning assets into reserves. The Federal Reserve System would have to, and probably would, intervene to prevent this process from becoming a serious threat to the financial structure of the banking system.

Borrowing from banks becomes more difficult as the crisis is prolonged. Delays in the repayment of outstanding loans are likely. The calling of loans is an action that bankers normally avoid. Conversion of earning assets into cash (at depressed prices) would be avoided by banks if possible. Borrowing of federal funds or borrowing at the Federal Reserve discount window would be a preferred action, provided that federal funds were available at an acceptable interest rate and the discount rate was not too high.

Even if adequate reserves and liquidity existed, banks would have to give careful attention as to which new loan commitments would be undertaken. Stringent selection criteria would probably be applied.

As indicated previously, financial institutions also provide other services such as preparation of payrolls for large corporations and public agencies, billings, etc. As a crisis became extended, the ability of these institutions to provide these services in a timely fashion might be adversely affected by such factors as absenteeism.

Problems faced by financial institutions during the Pre-CR Crisis Phase (within the context of a prolonged crisis) suggest the following policies:

- Increased open-market purchasing of U.S. Government securities should be undertaken to improve the reserve position of the banking system.
- Public information efforts should be undertaken to enhance orderly operations such as reduced withdrawals, speculation, etc.
- The ratio of reserve requirements should be adjusted to match the rate of deposit withdrawals.

- o Selective availability of funds should be allowed at the Federal Reserve discount window, possibly at a variable discount rate. In this way, encouragement could be given to those host area banks best prepared to meet the emergency.
- o Restrictions on large savings deposits withdrawals should be considered, including extension of waiting times prior to honoring withdrawals.
- o Curtail loans for non-essential purposes and curtail credit card cash-advance loans.
- o Restrict activities of financial markets --e.g., by curtailing the operating hours of securities, commodities, and options markets.
- o Eliminate margin transactions in the securities and commodities markets, curtail options market, and possibly lengthen the time before proceeds of sales are forwarded to sellers.
- o Control the flight of capital to other nations.

C. Financial Institutions in the CR-Initiation Phase

Consequences to financial institutions during this phase would largely be determined by preceding events. A prolonged Pre-CR Crisis Phase could already have had significant consequences to financial institutions. Institutions having well-developed relocation plans might have already made extensive preparation for relocation, and some fraction of these institutions might already have transferred some personnel to non-risk areas. If, on the other hand, the crisis period were short, the financial institutions would not have experienced large prior adverse consequences.

During the period immediately following the decision to implement the crisis relocation plans, great uncertainties would exist regarding the reserve position of commercial banks in the risk areas. Banks in the risk areas would not completely and automatically close their doors. During this period of days, banks would find it difficult to carry out their minimum activities of controlling the cashing of checks by depositors now located in host areas. In addition, some staff would be needed to perform the function of verifying the status of checks cleared. It is possible, however, that the number of checks written during this period could be reduced.

As part of nuclear war preparedness, banks have been urged to maintain duplicate records in safe locations [17]. Most of the largest banks in risk areas have duplicate records (91% of banks having assets of $1 billion or more), but many smaller banks in risk areas do not have such records [25]. While the records were not specifically designed for use in crisis relocation,

they could be used as part of the basis for operation of banks relocated in host areas.

At present, plans call for closing down securities exchange operations only in case of strategic attack. Serious consideration should be given to the desirability of closing down operations of securities, commodities, and options markets for the entire period of the crisis.

In addition to the policies previously discussed, the following policies appear to be required:

- o Promote plans for maintenance of bank check clearing operations in risk areas and transfer of other functions to host areas.
- o Promulgate the principles underlying loss sharing to be followed upon resolution of the crisis.
- o Implement the Agent Bank Plan.
- o Implement measures similar to Emergency Bank Regulation No. 1.
- o Consider implementation of foreign exchange controls to control capital withdrawals by foreigners.

D. Financial Institutions in the CR-Maintenance Phase

Financial activities within the risk area would probably be carried on at a greatly reduced level, whereas essential financial activities within the host area would occur at a greatly increased level. Banking functions continuing in the risk area would probably be limited to computer processing of checks and verification of checks cashed. While current plans would allow for cashing of checks to meet essential purposes, most banks would undoubtedly want assurances that funds were available. However, there would be no way of assuring that cash received was expended for such purposes. Moreover, the time required to clear checks would increase significantly as a result of transportation delays, even though the volume of checks written might be reduced.

The availability of cash to banks in host areas might be a continuing problem, depending largely on the ability to transport needed cash to the right banks at the right time. In view of heavy competing demands on the transportation system, some kind of reliable arrangement would be required for transporting cash from depositories to host area banks.

Problems associated with the control of credit card purchases must also be recognized. One such problem would be to control the purchase of non-essential goods. The prices of these goods might be steadily decreasing, while the prices of essential goods would probably be increasing, because of demand, scarcity, and some degree of hoarding. Thus, non-essential goods could have price advantages over essential goods; if funds were available, or if the use of credit cards was not controlled, non-essential goods might be purchased.

A basic problem of the banking institutions would be to preserve adequate reserves against sizeable and continued withdrawal of funds over an extended period of crisis. During the CR-Maintenance Phase, continued inflow of funds into time and savings deposit accounts could not be expected because persons would not want to tie up their funds for specified time periods, especially in the light of the great uncertainties regarding the outcome of the crisis. Some inflow of funds into demand deposit accounts could occur at host area banks if persons perceived that access to these funds was assured. Thus, banks in host and risk areas would face a situation in which withdrawals would continue to greatly exceed inflows into deposit accounts.

Banks, either in the risk area or the host area, would face compounding problems in the management of earning assets. Delays in loan repayments would diminish the use of loan repayments as a source of reserves. Uncertainty in the value of securities held, coupled with inability to dispose of them if the markets were closed or severely curtailed, would preclude orderly conversion of securities into reserves.

Current crisis relocation plans call for some 500 Agent Banks to assume some of the functions of the 12 Federal Reserve Banks. (The number of such Banks in non-risk areas remains to be determined.) These Agent Banks can perform functions such as check collecting and cash disbursements. It is also anticipated that the Federal Reserve System will operate at relocation sites, conducting operations such as the discount window, open market operations, and bank liquidity management. The ability of the Federal Reserve System to perform these functions under conditions of crisis relocation warrants additional study.

Functions performed by financial institutions other than banks would undoubtedly cease or be greatly reduced throughout the CR-Maintenance Phase. Losses incurred by these institutions would be large. Disruption of these functions would also have an adverse financial impact on the users of such services.

In addition to the policies discussed under the Pre-CR Crisis Phase and the CR-Initiation Phase, other suggested policies are:

- o Development of plans for minimal functioning of banks in risk areas, and for relationships with banks in non-risk areas.
- o Development of a plan and procedures for assuring an adequate supply of cash for banks in host areas.
- o Continued review of plans for operation of Agent Banks and the Federal Reserve Banks in a relocated mode.
- o Implementation of selective price and profits controls in host areas.

E. Financial Institutions in the CR-Reconstitution Phase

As was the case with other economic sectors, financial institutions could experience the greatest difficulties in the CR-Reconstitution Phase. These institutions will face the problems of reconfiguring their operations back to normal conditions, and making a full accounting for financial operations conducted during the CR-Maintenance Phase. Also, many competing demands would be placed on these institutions by other sectors of the economy, and priorities might have to be established to allow for orderly return to normalcy.

During the early period of CR-Reconstitution, financial institutions would engage in a number of activities to restore normalcy to the system. An orderly transfer of activities back to risk areas would have to be undertaken. This step would be highly dependent upon the prompt return of the necessary personnel so that accumulated backlogs of transactions could be eliminated and the urgent new demands could be met. Early efforts would include the collection of dishonored checks; determination of the status of demand, time, and savings deposits; determination of the

extent of uncollectable and questionable loans; determination of the value of securities and investments held; and general determination of the financial losses suffered.

Concurrently, additional tasks would be carried out by the national government to restore pre-crisis conditions. These actions would include: transfer of any delegated Agent Bank functions back to Federal Reserve Banks; selective phasing out of emergency preparedness regulations; orderly resumption of securities, commodities, and options markets; determination of appropriate balance of payment policies; and determination of appropriate monetary and fiscal policies.

Concerted monetary and fiscal policies would have to be implemented in order to meet the needs of the individual economic units and to stimulate the general economy. Monetary policy would endeavor to expand loans--open-market operations would have selective application. Fiscal policy would endeavor to support government expenditures. This might entail the selling of securities consistent with maintenance of the reserve position of banks. Balance of payments policies would be adopted that would steam the outflow of foreign capital and would attempt to attract additional foreign capital back into the United States.

Possible candidate policies that would assist needy individuals and sectors can be identified by examination of the specific conditions of each type of economic unit for specific crisis scenarios. The appraisal of impact of such policies on the national economy, however, cannot be accomplished without detailed econometric analysis. An initial screening of such policies can be accomplished through the use of a simplified econometric model of the type described in Section VI and Appendix A of this report.

The financial position of many financial institutions would also be precarious. To prevent undue damage to the financial system, losses attributed to crisis relocation should be settled promptly by the government. After a short period of time, resumption of loan repayments would contribute to the financial strength of the various financial institutions and to the acquisition of reserves by member banks. Such acquisition of

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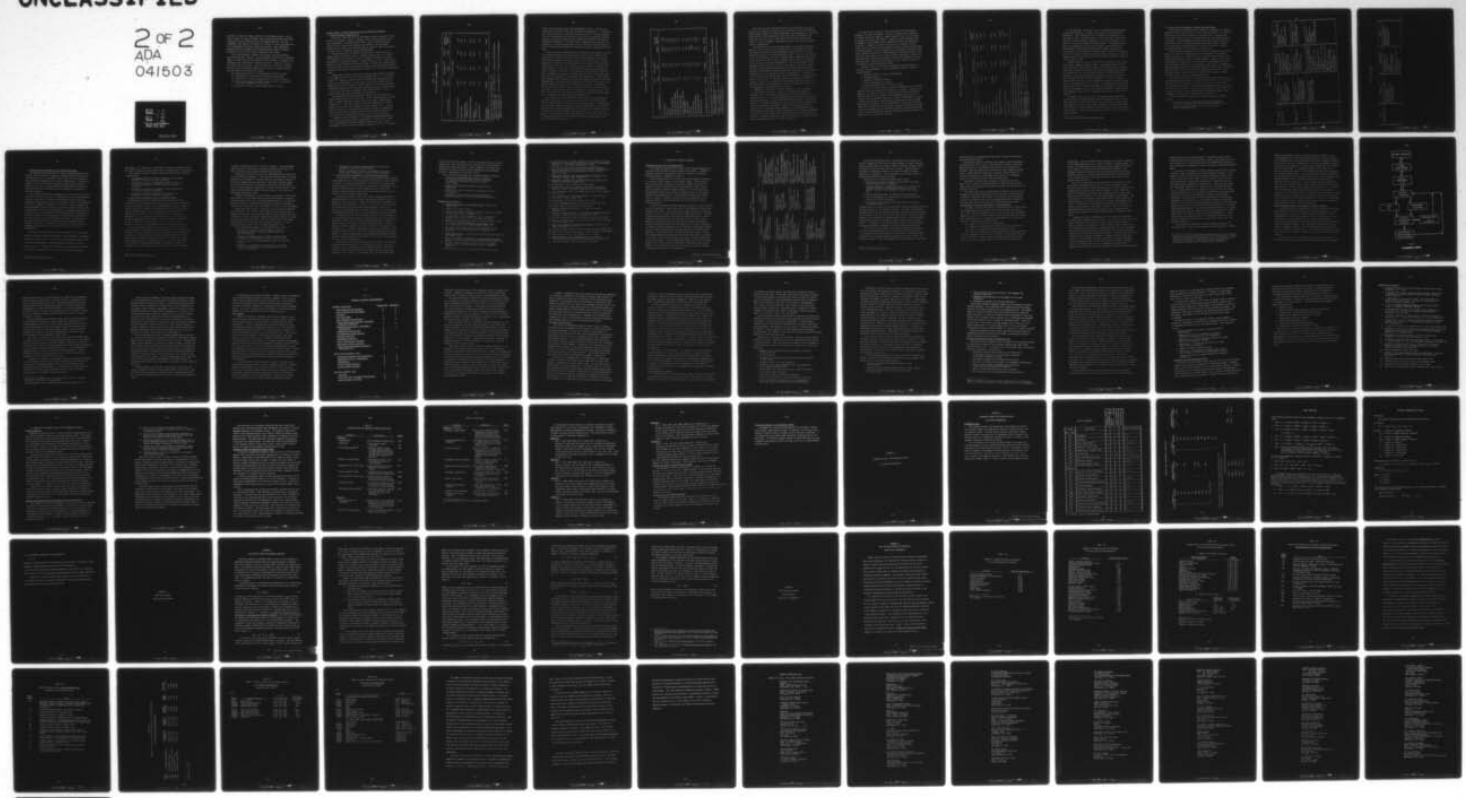

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reserves is a matter of highest priority for the banking system. After a lapse of time, the inflow of demand, time, and savings deposits could again be expected, and such deposits would also augment reserves. New loan commitments could again be initiated, but criteria for priorities might have to be established by financial regulatory agencies. These commitments probably should be earmarked for the working capital needs of essential businesses to allow for the orderly expansion of the economy.

The re-establishment of normal credit market functioning probably would take some time. However, time requirements would have to be balanced against the need for rapid reinvigoration of the economy. Rationing of all available credit funds might be required initially. Control of interest rates might also be required. Care would have to be exercised to provide an orderly, non-inflationary expansion of the nation's economy consistent with the needs for restarting the economy.

The overarching policies of the CR-Reconstitution Phase include:

(1) Preservation of the solvency of financial institutions.

(2) Equalization of losses attributable to the crisis relocation.

(3) Selection of appropriate monetary/fiscal policies contributing to an orderly expansion of the economy.

(4) Assistance to banks in making prompt loans to industry.

Economic Impact of Crisis Relocation on Local and State Governments

A. General Economic Characteristics

A variety of types and levels of governments would be affected by crisis relocation including: counties, townships, cities, special districts, and state governments. Governments derive their required revenues from many sources such as taxes on the individual and business, service charges, insurance trust revenues, and intergovernmental revenues. Table 19 indicates types and levels of revenues received by governments.

Municipal and county governments and some types of special districts depend heavily upon property taxes. Revenues from this source to cities in 1973 amounted to 24.1% of total revenue. Property tax revenue for county governments is usually much higher -- ranging from 25% to 75%. State governments have little dependence on property taxes. Property taxes would continue to accrue during a crisis relocation, and revenues from this source should be relatively unaffected if rapid economic recovery occurs in the CR-Reconstitution Phase.

States have a greater reliance upon sales and gross receipts tax which in 1973 made up 28.6% of total revenue as compared with 7.2% of revenue for cities[1,26]. States also receive 22.8% of revenue from licenses and other taxes such as income taxes. Cities receive only 6.2% from these sources. Revenue from these taxes might be greatly reduced for states during crisis relocation; essentially all such revenue would be lost to local governments in risk areas. Host areas governments could receive higher or lower revenue from these sources depending upon consumption.

Municipalities and special districts receive significant amounts of income in payment for services delivered. In 1973, municipalities received 28.4% of income from service charges such as utilities, transportation systems, etc.[1]. Some special districts receive essentially all of their income from services (e.g., bridge tolls, water service, etc.). During crisis relocation, this income would be greatly reduced or eliminated in risk areas and possibly increased in host areas. Special districts in risk areas would be especially vulnerable to loss of service income.

States and local governments are receiving increasing proportions of their income from higher levels of government[26]. In 1973, state revenue from intergovernmental sources (primarily federal) was 25.2%. Intergovernmental revenue (state and federal) represented 31.5% of city revenue.

Table 19

STATE AND LOCAL GOVERNMENT REVENUE

Type of Revenue	State[1] (1973)	Municipality[1] (1973)	County[3] (1972)	Special District[2] (1972)
	% of total revenue			
Sales and Gross Receipts	28.6%	7.2%	-0-%	-0-%
Property Taxes	1.0	24.1	35.6	13.5
Licenses and Other (income tax, etc.)	22.8	6.1	6.0	-0-
Intergovernmental Revenue	25.2	31.5	41.2	22.7
Services (utilities, etc.)	11.0	28.4	16.0	63.2
Insurance Trusts	11.3	2.6	1.2	0.6
Total Revenue ($ million)	$129,978	$49,326	$24,169	$5,189

(1) Statistical Abstracts, Tables 433 and 438, 1975

(2) Census of Governments, Vol. 4, Govt. Finances, No. 2: Finances of Special Districts, Bureau of the Census, 1972

(3) Census of Governments, Vol. 4, Govt. Finances, No. 3: Finances of County Governments, Bureau of the Census, 1972

Larger cities often have higher intergovernmental revenue. In 1973, this revenue was 43.2% for New York City, and 58.1% for Baltimore[27]. In this same year, special districts received 30% from these sources. Intergovernmental funds for some purposes could be reduced by crisis relocation since funding is often for narrowly defined specific expenditure purposes[26] that might be temporarily suspended (e.g., school classes, community health services, etc.). Presumably, if traditional government aid is forthcoming, other intergovernmental revenue would be supplied for emergency operations, welfare, and other needs.

State and local governments have been providing a great range of services to the general population including public welfare, police protection and corrections, fire protection, health services and facilities, housing and urban renewal, highways and streets, utilities and transportation, natural resources and recreation, social insurance, and a variety of other services. Expenditures in 1973 for such categories for state and city governments are given in Table 20. State and local governments also provide assistance in times of emergency or disaster. These agencies generally have to absorb at least a proportion of emergency personnel and other costs, even though there may be no funds earmarked in their budgets for this purpose. State expenditures emphasize public welfare, education, and highways, while for cities the expenditures are more uniformly distributed over a range of activities, with highest expenditures in the areas of education, utilities, and emergency services (police and fire)[1]. Wide variations, however, occur in both state and cities. Thus, while New York City, Baltimore, and Washington, D.C. have heavy city expenditures for education, Los Angeles, Houston, and Dallas have none -- depending upon independent school districts[28].

Crisis relocation could bring significant changes in these expenditure patterns. Expenditures for states and host areas on public welfare might have to increase greatly to meet the five-to-tenfold increase in unemployment during crisis relocation and possible lingering unemployment in the CR-Reconstitution Phase. Welfare claimants from risk areas might or might not still be eligible for regular payments from risk areas for the crisis relocation period. Special districts would presumably still be faced with the necessity for making expenditures for such items as salaries and maintenance, even though revenue would be curtailed.

Table 20

STATE AND LOCAL GOVERNMENT EXPENDITURES

Type Expenditure	State [1] (1973)	Municipality [1] (1973)	County [2]	Special [3] District
Public Welfare	18.2%	7.1%	25.0%	-0-%
Education	35.0	12.6	16.5	3.5*
Highways	12.6	6.1	11.3	3.0
Health and Hospitals	6.2	5.9	13.4	21.0
Housing and Urban Renewal	0.4	3.5	-0-	21.7
Natural Resources, Recreation	2.3	3.6	3.3	8.9
Police and Corrections	2.2	9.1	6.2	-0-
Social Insurance, Financial Administration	2.2	1.3	2.6	-0-
General Control	0.9	2.3	5.7	-0-
Utilities	---	15.5	0.0	11.6
Fire Protection	---	4.9	0.006	1.6
Sewage and Sanitation	---	7.9	0.2	-0-
Miscellaneous and Other	12.1	16.9	13.7	28.5*
Insurance Trusts	7.7	3.2	2.3	-0-
Total Expenditures ($ million)	$118,836	$48,020	$23,932	$5,688

(1) Statistical Abstracts, Tables 433 and 438, 1975 Bureau of the Census

(2) Census of Governments, Vol. 4, Govt. Finances, No. 3: Finances of County Governments Bureau of the Census, 1972

(3) Census of Governments, Vol. 4, Govt. Finances, No. 2: Finances of Special Districts, Bureau of the Census, 1972

* Includes school buildings only.

Many state and local government services such as police, fire, health, sanitation, and welfare, would be heavily involved in the CR-Initiation and CR-Maintenance Phases with resulting abnormally high expenditures. Resulting budget deficits could subsequently cause reductions in expenditures for many other activities such as urban renewal, and construction and maintenance of streets, highways, and public buildings, with consequent higher levels of unemployment.

The ability of state and local governments to withstand the economic impact of crisis relocation would depend upon the underlying soundness of the financial structure of these governments and their ability to raise additional revenues in the CR-Reconstitution Phase. Most state governments are in sound financial condition, although economic downtrends such as the recent recession can have a serious adverse effect primarily on industrial states such as New York and Massachusetts[29]. Cities vary greatly in the soundness of their financial structure. Most major cities face a range of well-publicized problems in providing services within available revenue. Some major northeastern metropolitan areas are currently in or near serious difficulty (e.g., New York City, Detroit, Philadelphia)[30]. Special districts generally have sinking funds that would provide for coverage of debt service in the event of a temporary reduction or stoppage of revenue[31]. However, loss of revenue earmarked for operations could create deficits in operating budgets and consequent need for raising additional funds or receiving additional intergovernmental assistance.

Managing of cash flow is a constant problem for local governments even under normal conditions. Because of the uneven distribution of receipts over the year and the needed funds for capital investments, insurance trust, etc., local governments usually hold substantial cash and short-term securities. In 1972, cash and security holdings of cities were equal to 41% of annual expenditures. Almost one-half of this amount, however, was for employee retirement, offsets to debt, and bond funds[32]. Finance officers generally develop schedules of cash requirements based upon current and anticipated needs[31] and arrange for the orderly redemption of securities, taking into account anticipated revenue so as to meet this schedule. Normally, requirements tend to deviate from the schedule so that the schedule generally must be revised frequently[31].

An event such as a crisis or crisis relocation could cause major changes in the cash requirements. There is a tendency under conditions of economic stress for vendors to submit invoices to the city earlier in an attempt to build up cash reserves. Emergency service personnel might be augmented, causing higher salary payments both before and during the relocation. Slowdown of revenue receipts prior to, during, and after crisis relocation would also place greater strain on existing liquid assets of the municipality. For the average city or municipality, existing liquid assets should be sufficient to allow meeting of all essential needs. However, this would result in late paying of bills, reduction in current costs and maintenance, depletion of deposits, and the early redemption of short term securities. These activities would, in turn, reduce the ability of the financial system to provide new credit.

The debt structure often reveals the general financial health of local and state governments. These governments borrow for a number of reasons including:

- o Capital investment in land and improvements
- o Equipment purchases
- o Coverage of operating deficits
- o Cash in anticipation of revenue
- o Pension obligations not previously covered[31].

The ability to service debt is a primary consideration of all governments, as the recent plight of New York City will attest. Default, even temporary or technical, can have a significant effect on the rating of bonds in areas or cities involved, with consequent marked increase in interest costs and possible reduction of access to bond markets. Failure to service debt during a crisis relocation would pose a unique problem which might be solved by a moratorium imposed by the federal government. Inability to service debt in the period following crisis relocation might also be quite damaging to the financial position of governments involved. Table 21 indicates pertinent debt and other financial characteristics for states and cities and special districts.

Table 21

FINANCIAL STRUCTURE OF STATES AND LOCAL GOVERNMENTS
(Millions of Dollars)

Category	State[1]	Municipality[1]	County[3]	Special District[2]
Debt Outstanding	$ 59,375	$56,041	$13,985	$24,987
Long-term	55,701	49,286	13,051	22,834
Short-term	3,674	6,755	934	2,153
Debt Retired				
Revenue (total)	$129,800	$39,362	24,169	$ 6,821
Revenue (own sources)*	97,108	33,764	13,696	3,640
Cash and short-term Securities (total)		17,917[2]	9,308	6,688[2]
Cash and Securities (Other)†		10,012[2]	4,370	2,742[2]
Coverage Ratio**	0.61	1.66	1.02	NA

*Total revenue less revenue from intergovernmental sources

†Other than employee retirement, offsets to debt, and bond funds

**Total debt to annual revenue from own sources

(1) Statistical Abstracts, Tables 433 and 438, Bureau of the Census 1975

(2) Census of Governments, Vol. 4, Govt. Finances, No. 2: Finances of Special Districts, Bureau of the Census, 1972

(3) Census of Governments, Vol. 4, Govt. Finances, No. 3: Finances of County Governments Bureau of the Census, 1972

In the aggregate, states and cities are financially sound although, as mentioned previously, a number of major cities are facing serious difficulties. The "coverage ratio" is a measure of the adequacy of a government's "own*" income with respect to its total debt. Such ratios vary over time with economic conditions (e.g., 1.77 in 1969 and 3.14 in 1934) but in 1973 were within the accepted range[31]. Borrowing by state and local governments to cover initial losses in revenue during the CR-Maintenance Phase would not significantly change coverage ratios. For instance, if the average city borrowed funds to make up for a month's loss in all revenue from sales and gross receipts, use taxes, and service charges, the ratio existing in 1973 would have been increased to about the ratio existing in 1969.

Special districts such as utility districts generally carry a heavy load of debt compared to annual revenue. The average district in risk areas would have sinking funds available to provide for debt service but might need assistance if salaries and necessary maintenance were going to be continued for the crisis relocation period. The more financially vulnerable cities and special districts might not be able to absorb the extra expenses and loss of income consequent to a crisis relocation. New York City and other cities in northeastern United States show coverage ratios in a range well above the average. In addition, New York City and several other cities have the added problem of excessive short term debt that is the proximate cause of the threatened defaults[30]. (New York City short term debt was 23% in 1973 compared with an average of 12% for all cities[28].)

In summary, most cities, states, and special districts should be able to absorb the losses associated with the immediate effects of crisis relocation, but this effort could result in a depletion of liquid assets. This condition, in turn, could cause a reduction in services and capital investments for a period following crisis relocation. Also, weak economic units already in financial difficulties would need special consideration to avoid bankruptcy.

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*Total revenue less intergovernmental revenue.

B. State and Local Government in the Pre-CR Crisis Phase

Crisis induced disruptions among individuals, businesses, and financial institutions would quickly affect state and local governments. A slowdown in industrial activity and the tendency of economic units to conserve cash could rapidly reduce revenue for government services, and reduce and delay tax payments. Intergovernmental payments might also be delayed because of conservative policies or absenteeism among government workers. Payments of all kinds might be delayed because of reduced efficiency of financial operations and delays in mail delivery (see Table 22).

Local and state governments would be trying to maintain regular services while at the same time expanding efforts and expenditures for emergency preparations and crisis control actions. Governments would likely receive accelerated demands by vendors for prompt payments. However, other factors would suggest a slowing of the rate of payment by governments, and since local government expenditures are equivalent to 16% of GNP[1], a slowdown in payments might slow the rate of payments throughout the economy. Absenteeism among government and contractor personnel might raise the unit costs of delivering regular services because of inefficient crew sizes, overtime, inadequate system control, scheduling delays, etc.

The increased expenditures and reduced receipts could result in cash flow problems, making necessary a greater use by governments of cash deposits and possibly early redemption of short term securities. Disruptions in security markets might limit redemptions or exchanges and cause a reduction in the value of securities. Administrators might begin to defer additional activities in order to stay within previously established budgets, with consequent loss of income to employees and contractors.

These considerations suggest the following research and planning efforts:

- Provision of funds to assist state and local governments to accelerate planning and control activities during crisis.
- Review of government capability to maintain financial operations during crisis.

Table 22

LOCAL AND STATE GOVERNMENT

Phase	Revenue	Expenditures	Assets
Pre-CR Crisis	Reduced payments for services Reduced tax receipts Slowdown of intergovernmental payments	Crisis preparation and control costs Accelerated vendor payment demands Slowdown in payments Rise in unit cost of services	Redemption of short term securities Greater use of cash deposits Deferred loan programs
CR-Initiation	Tax revenue reduced or stopped Reduced earnings because of curtailment of services Intergovernmental payment for emergency services	Increased costs of emergency services Reduction in non-emergency expenditures Deferral of payments	Unavailability of liquid assets (risk) Loss and damage to equipment and facilities
CR-Maintenance	Reduced earnings (risk) Increased revenue (host) General delay in payments	Costs of evacuee maintenance Costs of protective measures Costs of key worker transportation Costs of host area control measures Ongoing salary and maintenance costs Continued cost of terminated operations Welfare institutional costs Debt service Other prior obligations Demands for early payment from vendors Cash flow problems (host area and state)	Controlled access to deposits Impaired market for securities Loss or damage to facilities and equipment

Table 22 (Concluded)

Phase	Revenue	Expenditures	Assets
CR-Reconstitution	Below normal tax revenue Lower service revenue Delayed payments Reduced interest income Increased intergovernmental revenues	Increased welfare and unemployment costs Payment of accrued earnings Payment of obligations Increased maintenance costs Intergovernmental claims Deferral of new obligations	Depleted liquid assets Restrictive credit Reduced asset values Reduced tax base

C. State and Local Governments in the CR-Initiation Phase

The disruption associated with the crisis relocation movement would sharply reduce the receipt of payments. Earnings would also be greatly decreased because of a curtailment of many normal services supplied by state and local governments (e.g., regular transportation). Lower public consumer activity would reduce revenue from sales and gross receipts taxes, use taxes, etc.. Intergovernmental earnings would be reduced for normal state and local functions, but would probably be increased for emergency functions.

Local and state personnel, equipment, and facilities would be heavily involved in the relocation effort. Associated cost would include salaries of regular, part-time, and temporary government personnel, supply and maintenance of government equipment and facilities, costs of requisitioned facilities, equipment and supplies, and the like. Local government and state government would be obligated to cover at least part of these costs. Actual payment of new and prior obligations by government would have to be deferred because of the restricted financial operations of government and financial institutions. Non-emergency activities would be curtailed in host areas and in the state and halted in risk areas. However, many of the costs associated with such activities would continue, including salaries, debt service, maintenance, and insurance. Payrolls of local government alone account for approximately one-half of total recent expenditures[1*].

During this period, liquid assets would generally not be accessible because of temporary shutdown and transfer of some operations of financial institutions to host areas. Use of facilities and equipment might result in a general downgrading of these assets through damage, extra wear, modification, etc. Shutdown of facilities in risk areas such as utilities could result in additional costs of start-up, additional maintenance

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*Table 421, Statistical Abstracts.

requirements, etc. Reduction of non-emergency services in risk areas could also result in damage to assets (parks, etc.) and added costs for restoration.

The foregoing conditions suggest planning efforts directed toward the following items:

- o Development of plans for orderly shutdown of non-essential economic activities of risk area government.
- o Development of plans for maintaining essential activities of risk area government including essential financial operations.
- o Provision for initiation of emergency financial operations of host area and state governments.
- o Provision for maintaining control and integration of government facilities, equipment, and supplies.

D. State and Local Government in the CR-Maintenance Phase

Risk and host areas will present distinctly different economic conditions during the CR-Maintenance Phase. Revenue to local governments in risk areas would be sharply curtailed throughout this phase because of loss of taxes on sales and gross receipts taxes, use taxes, etc. These sources represent about 45% of total revenue of local governments[1*]. In addition, there would be a loss of income for curtailed services to inhabitants -- i.e., utilities, and transportation -- and possible loss of intergovernmental revenue related to schools, community health, and the like. These effects could result in losses of 50-75% of total revenue of risk area local governments during the CR-Maintenance Phase.

Host areas would presumably still receive tax revenues from most regular sources; however, some such tax and general service revenues might be reduced because of emergency controls curtailing purchases and government services. Added revenue from evacuee populations would probably be minimal since essential services would probably be supplied at no cost. Intergovernmental funds for emergency services to host area governments would increase, although reductions might be expected in revenue for curtailed services. Host areas as well as other functioning areas might

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*Table 438, Statistical Abstracts.

continue to experience delays in receipt of payments. State governments would also have a reduction in the sales and gross receipts taxes, use taxes, and income taxes normally obtained from risk areas.

Additional costs associated with the CR-Maintenance Phase would fall upon all levels of government. Costs would include maintenance of evacuee populations, development of protective measures, and regular transport of key workers between host and risk areas. Risk areas, although largely shut down, would continue to experience costs associated with salaries for all regular employees, maintenance, security, and debt service. These costs would substantially exceed revenues accruing to local risk area governments during this period.

Expanded requirements for service placed on contractors in host areas would result in larger expenditures and more rapid demands for advances, progress payments, and loans to finance expanded operations. Rising costs and reduced revenue, together with reductions in support from financial institutions, could cause cash flow problems for local and state governments.

Under traditional concepts of operation, local and state governments would continue to have access to their liquid assets, provided that the financial institutions with which they normally conduct business were still functioning. However, governments might find an impaired market for short term securities that could cause losses and increase cash flow problems. Increased use of some facilities and equipment in support of crisis relocation would probably result in higher maintenance costs.

These considerations suggest the following planning efforts:

- Provision of means for continued payment of risk area government personnel carrying out assigned duties in host or risk areas.
- Provision of necessary funds to support local and state governments in maintaining the crisis relocation posture.
- Review of losses of intergovernmental funds from curtailed services.
- Examination of feasibility of state and local government financial operations with reduced support services from financial institutions.

- o Determination of funding responsibilities of the several governments involved in a given region.
- o Review of possible liabilities of governments for private sector losses growing out of crisis relocation operations.

E. State and Local Governments in the CR-Reconstitution Phase

Tax and service revenue to state and local governments might continue below normal level in the CR-Reconstitution Phase because of slow start-up of industry, and lingering unemployment. These factors, together with a general reduction of liquid assets of individuals and businesses, could result in delayed payments and tax delinquencies on a large scale. Continued delay in payments might also be experienced because of heavy backlog of work in financial departments.

Risk area governments would be faced with an immediate problem of making payments of accrued earnings of government personnel as well as payments on other obligations. Repair and maintenance of equipment used during the crisis relocation, and start-up costs of risk area facilities will probably greatly exceed normal budget estimates. Since on the average, local governments have liquid assets about 40% of annual budget, most governments would be able to avoid an immediate cash flow problem[32].

Federal, state, and local governments would need to make payments to cover requisitioned labor supplies, equipment, and facilities used in the relocation. Added costs would result from implementation of protective measures and their removal in the CR-Reconstitution Phase, including emergency shelters, shielding materials, modification of congregate care facilities, etc. Government responsibility might be established for some privately insured costs or losses, with consequent additional government payments. Lingering unemployment and accrued employee benefits, welfare, and other transfer payments would increase cost and cash flow requirements for state and local governments.

Depleted cash reserves and reduced credit availability of local and state governments might result in a substantial increase in the rate of redemption of short term securities at unfavorable rates. Many other government assets might have decreased in value, including securities, equipment, and facilities. In risk areas, the crisis experience might

bring about structural changes relating to the desirability of living in urban areas. This trend could cause a leveling off or a reduction in assessed values and the tax base. These conditions could cause local government to reduce and defer planned expenditures, with resulting decrease in employment and contractor activity.

These considerations suggest the following planning activities:

- o Provision of intergovernmental financial assistance in the CR-Reconstitution Phase to allow continuation or expansion of government activities to improve local economy.
- o Plans for meeting heavier payments for welfare and unemployment.
- o Provision for rapid restoration of government facilities and equipment.
- o Procedures for rapid settling of intergovernmental obligations growing out of crisis relocation operations.

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V. SELECTION OF ESSENTIAL INDUSTRY

Industrial Activity in a Developing Crisis

The problems and objectives of industry would change substantially as the sector moves through the various phases of the crisis. A summary of problems, objectives, and selected actions for industry in different operational phases is presented in Table 23.

The increasing severity of a crisis would bring problems to industry as it would to other elements of the economic system. These problems would be particularly important for essential industry which would be required to produce goods and services throughout the crisis. As the crisis increased in severity, industry might be faced with increasing absenteeism and disruption in supply and demand as well as other support systems such as transportation. These conditions would cause economic losses to industry in general and would reduce the capability of the essential industry to meet planned activity levels during the crisis relocation period.

To assure the needed industrial capability during the crisis relocation period, the essential industry would have to take preparatory steps before and during the crisis. These steps would include measures for increasing readiness to protect current operations and financial stability. Updating of plans would be desirable to assure that responsibilities were properly delegated to keyworkers, that the type and level of activity of each essential facility was known, and that plans for action were complete. To sustain production during the crisis relocation, it might be desirable to consider increasing inventories of key items and other support elements, such as is done by manufacturers that are expecting a strike among major suppliers. Efforts would have to be made to determine capacity to meet the financial demands during the crisis relocation period (e.g., salaries) in the light of the likely disruption in receipt of accounts payable and possible curtailment of certain supporting financial services from regular sources (e.g., credit, payroll preparation). Adjustments might also be needed in current activity because of such factors as change in demand, conservation of inventories, absenteeism, etc.

Table 23

ESSENTIAL INDUSTRY BY OPERATIONAL PHASE

Operational Phase	Operational Problems	Objectives	Selected Actions
Pre-CR Crisis	Absenteeism Supply disruption Changes in demand patterns Support services disruption	Increase readiness Continue activities	Update plans Identify and assign personnel Increase inventories Assure support services Assure financial resources Adjust current activity level
CR-Initiation	Unavailability of workers Industry shutdown Damage Loss of inputs and support services Loss of normal demand sources Disruption of supply channels	Implement CR plan Provide industrial protection Establish alternate supply and support sources	Assemble key workers Restrict activity to essential processes Invoke plant emergency regulations Initiate control of key inventories Conduct orderly shutdown of non-essential activities
CR-Maintenance	Depletion of key inputs Breakdown of support systems Liquidity problems Absenteeism Rise in unit costs	Maintain essential industrial activity Distribute products and services Guard against damage or loss	Provide inventory control Assure re-supply Dispose of secondary products and services Provide payments and services to workers Acquire payments and credit Define production schedule
CR-Reconstitution	Uncertain demand Imbalanced inventories Uncertain supply Inadequate liquidity and credit Lowered operational efficiency Worker needs High level of accounts payable and receivable	Restore normal activity Provide required finance Reduce residual CR effects Provide maximum employment Re-establish normal demand	Reconvert and reactivate industry Recall workers Provide credit and cash Activate marketing Assure payments and receipts Restore inventories

During the CR-Initiation Phase, few workers would be available to carry out industrial activities at essential plants or to shut down non-essential plants unless the workers' safety and support had been assured, or unless the relocation was carried out in steps. Such precipitous termination of industrial efforts could result in damage to plants, inventories, and products. At the same time, the pre-crisis pattern of demand and distribution would be changed.

Objectives in the CR-Initiation Phase would include:

- o Re-establish patterns of demand and distribution associated with the crisis relocation posture.
- o Increase readiness for essential activity -- i.e., notify and assemble key workers, reconfigure production lines and service operations, modify inventory control of key items, etc.

In the CR-Maintenance Phase, the primary objectives would be:

- o Achieve and maintain the needed levels of industrial activity.
- o Provide for proper distribution.
- o Guard against loss or damage that would inhibit restoration of normal activities.

Problems would occur early in this period when unexpected shortages developed in selected inputs to the industrial process. Over time, these selected shortages would turn into widespread shortages, eventually forcing shutdown of the essential activity or the timely reactivation of supplier activity. Manufacturers' inventories of durable goods are twice the average monthly sales, and inventories of non-durable goods are about equal to monthly sales[1*]. Consequently, at the normal rate of sales, it would be several weeks before widespread shortages in manufacturing inputs developed.

From the financial viewpoint, the essential industry would have to be able to continue payments to key workers and to supporting services at a time when receipts were uncertain, giving rise to liquidity problems. The problem of absenteeism among key workers might further curtail the ability to operate. Costs of production might increase because of possible

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*Table 1250, Statistical Abstracts.

inefficient levels of production and the loss of income from curtailed operations and by-products.

New problems would face industry (both essential and non-essential) following the end of the crisis. There could be a period of uncertain demand since most of the population would suffer from a depletion of available funds and perhaps uncertainties about their immediate economic future. Having depleted inventories, essential industries might be faced with shortages that would hamper activities for a considerable period, with resulting financial loss and unemployment.

Depending on actions taken, shortages of liquidity and credit might occur. Financial conditions might be further distorted by high levels of accounts payable and receivable that might be reduced only at an abnormally slow rate.

The primary goal in this CR-Reconstitution Phase is taken to be the resumption of peacetime industrial activity levels as soon as possible. To this end, objectives must include: providing the required financial assistance to support operations; encouraging high levels of employment at early times; and restoring peacetime supply and demand patterns.

Relationship of Industry Requirements to National Policy

The types, locations, and levels of industrial activity needed during the CR-Maintenance Phase ultimately derive from national objectives in the crisis. Precise statements of policy have not been made, and perhaps cannot be, prior to the crisis; however, there are three basic objectives that, either singly or in combination, would underlie any future policy decision. These objectives would include:

(1) Support of the crisis relocation effort.

(2) Support of preparations for postattack recovery operations.

(3) Support of present and planned military operations.

The scale of the industrial support would depend on which objectives were to be implemented and the level of support to be provided under the selected objectives. Thus, support effort would be much less if only objective (1) were undertaken than if all three objectives were to be

accomplished. Also, the support would be scaled to the relative austerity of the system requirements (e.g., steak for dinner vs. bulgar wafers). In general, the needed support would require less than complete utilization of the capacity of industrial sectors identified as essential. The fundamental problem in essential industry planning would therefore be to determine capacity or activity level actually needed in each industrial sector and the portion of this activity (if any) that would have to be supplied from risk areas.

The level of industrial activity devoted to the production of goods would also be dependent upon the level of existing inventories and reserves as well as policy decisions relating to the degree to which these inventories and reserves could safely be reduced. For all industries, materials consisting of unfinished and finished goods are in the supply chain or exist as inventories in retail and wholesale establishments. The sufficiency of these supplies to meet demands during crisis relocation is highly variable. For certain items (e.g., clothes), where demand can be held at a low level for a short period, such inventories and goods in transit would probably be sufficient. For other items (e.g., food), the demand might have to be met at least partially out of new production. National policy might also dictate against drawdown of supplies of these goods.

Together with these considerations of scale, the general objectives would determine industrial activity levels. To support the crisis relocation effort, the nation must continue to provide the essential goods and services needed by the population in the relocated posture, together with all required ancillary activities. Included would be the basic necessities such as food, shelter, energy, and health services for all the population. Industrial activity must be sufficient to permit: the continued functioning of non-risk area economies; operation of essential industry inside and outside of risk areas; and the supply of materials for use in providing protection against weapons effects and/or recovery therefrom. Required ancillary activities would include: transportation, warehousing, communications, building activities and materials, government administration,

financial services, and other activities. Corollary concepts usually associated with this objective require, in effect, that industrial activity be structured so as to be efficient during the CR-Maintenance Phase and least disruptive to resumption of normal activities in the CR-Reconstitution Phase.

Inclusion of the postattack recovery support objective would introduce additional output requirements for various essential industries. Such industrial activity would be directed toward providing a basis for post-attack recovery that would likely survive a strategic nuclear attack on the United States[2], including the building up of industrial resources and organizational capability in non-risk areas. Additional activities for this purpose might include: production of recovery-oriented goods (e.g., structural materials, key industry producer equipment and inputs, critical components, etc.); relocation of inventories of essential goods from risk to host areas; development of personnel, organizational capabilities, and facilities that permit functioning of non-risk areas independent of risk areas (e.g., central bank functions, distribution systems, etc.); and the initial development of resources and organizational capabilities for recovery of risk area industries subsequent to an attack. Underlying assumptions for this objective are that attack is a reasonably likely possibility and that reduced efficiency and disruption of normal operations are acceptable to improve postattack preparedness. In this latter sense, this objective tends to be competitive with some of the desirable properties associated with a system based entirely on crisis relocation support*.

The industrial requirements for military support during the CR-Maintenance Phase could vary from minimal production designed to replace

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*An example is the food distribution planning wherein the most efficient approach for food distribution appears to be the continued use of central supply and warehousing of risk areas[3]; however, from the point of view of postattack viability, a rapid change to food preparation and distribution centered in non-risk areas would be preferable.

supplies and equipment used in any current military operations to the full implementation of a military mobilization plan. Cognizant agencies of the Department of Defense would specify the types of military production and specific facilities. Determination of support requirements, however, would involve other agencies at the national, regional, and local levels. Decision would depend to a considerable degree on the timing of the military buildup with respect to the CR-Initiation Phase and the duration of the CR-Maintenance Phase. In the case where the military buildup and CR initiation occured at about the same time, much of the required military material probably could be obtained from existing reserves without additional military production. If the military operations started well before the CR-Initiation Phase, existing reserves might already have been deployed, with consequent higher required production levels. The duration of the CR-Maintenance Phase would determine for military production facilities, as for essential industry, the need for the product of secondary suppliers. Over short periods, most essential military facilities could produce needed goods using existing inventories. However, as the duration of the period increased, a wider and wider range of industrial suppliers would be needed to replace depleted inventories.

General Planning Steps in the Selection of Essential Industry

One desired result of planning would be a list of specific facilities with their individual production goals and support requirements. To this end, planning must start with given national requirements of a set of pre-determined survival and/or support items (on a national total or per capita basis), and with knowledge about the expected performance of the national geo-industrial complex that would be required to supply these items in appropriate amounts. This information would be translated by means of systematic procedures into the needed detailed designations of essential facilities and key workers. Such planning would normally require the participation of national, regional, and local governments and private industry.

The basic sequence of planning steps is illustrated in Figure 2. The initial steps to be taken at the national level would be to establish

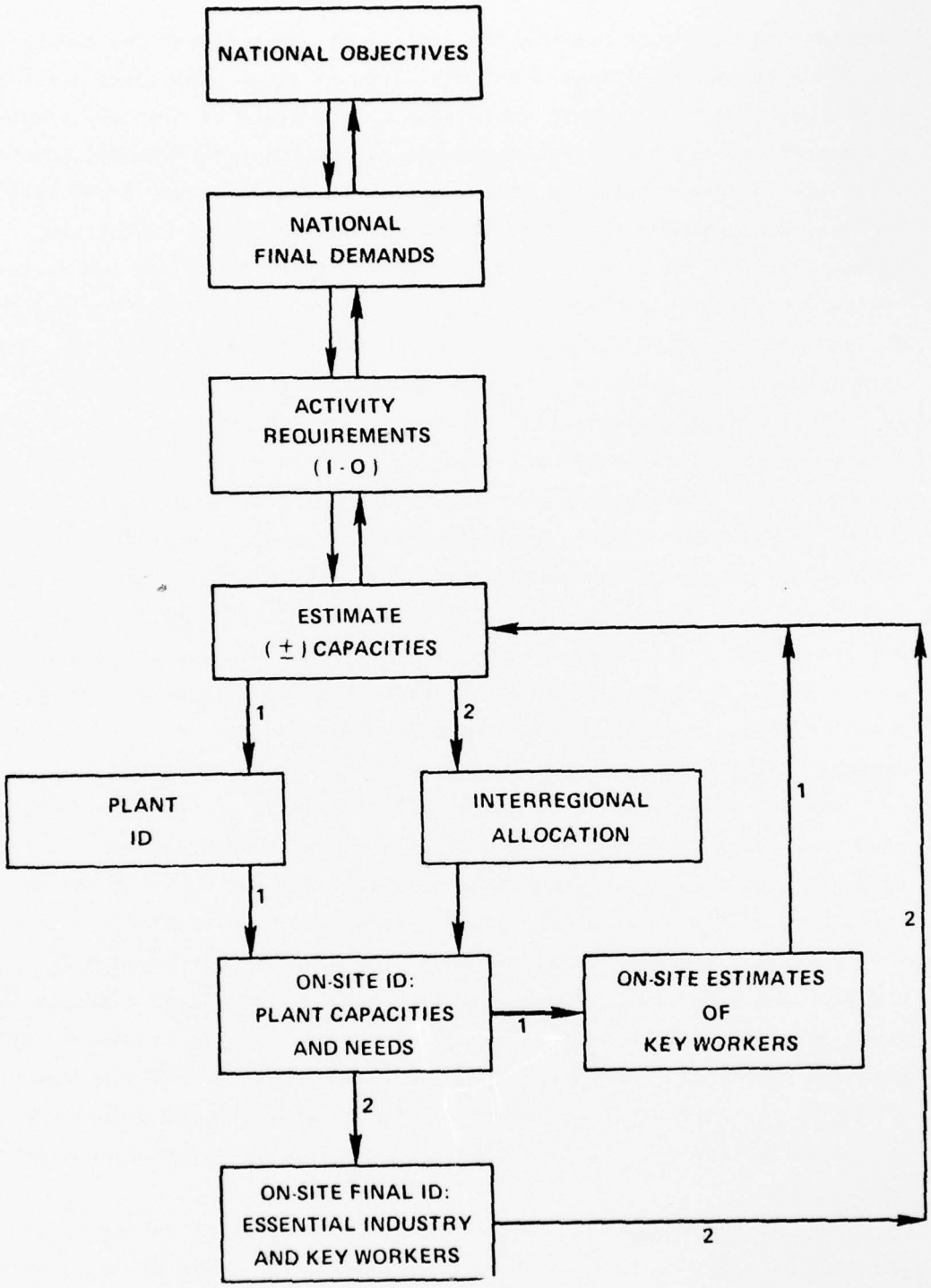

FIGURE 2

PLANNING STEPS

general objectives and to use these objectives, together with knowledge of needs of various economic units, to derive specific final demands of the nation for various goods and services. This planning procedure has been used frequently by public and private agencies to determine quantitative requirements at national and regional levels. In the present instance, the process must be carried out at an appropriate level of detail* so that the final statement of demands can be related to the product of specific production facilities.

The next planning step introduces a basic industrial production model for translating the statement of final demands into statements of the required aggregate levels of activity in each essential industrial sector. An input-output model provides the necessary relationships between inputs to production of any type and final consumer demand. Results should be generated for industrial requirements aggregated at the national level, and if possible, at the regional (or state) level*.

The outputs of required industrial activity levels (after inventories are taken into account) at national and regional levels can be then compared with actual capacity data for the same industrial categories in risk and non-risk areas. Within the limitations imposed by other systems considerations (e.g., distribution systems, unique suppliers, etc.), the planning would emphasize the use of host area capacity to meet requirements. Initial estimates of deficits and surplus capacity in host areas would then be established for each region and for the nation.

Tabulations of capacities, requirements, deficit, and surplus capacities for each essential industry sector could be supplied by the national level to the local and regional planning staffs as initial guidance on the specific goals of detailed planning. The national level, using existing data bases†, could also supply detailed listing of risk and non-risk area facilities in essential industrial categories.

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*Description of demands at the 4 or 5 digit level of the U.S. Standard Industrial Classification is recommended.

†Dunn and Bradstreet data on business establishments; Census data; etc.

Given this initial guidance, local and regional planners would make on-site determinations of the suitability of specific facilities to meet specified production and service goals. Local planners would assess the feasible levels of production in a given facility, the inventories and key workers, and the support requirements, as well as any other critical industrial problems that might hinder implementation of the plan. The on-site planning should assess the feasible levels of activity outside and inside risk areas, together with the likely maximum duration of activity in the relocation mode. Additional information to be obtained would include capabilities of alternate facilities and essential suppliers, and other sources of essential inventories. Where deficits existed in regional capability of non-risk areas, local and regional planners would determine additional product and services needed and normal sources of supply (e.g., either a local risk area or other regions).

These locally generated data on essential industry and key workers for risk and non-risk areas, together with estimated interregional requirements, would be returned to the national level for review. National level planners would then make an allocation of essential industry products and services among regions with deficits and surplus non-risk area production. This allocation step might be handled by either heuristic or mathematical optimizing procedures. Remaining deficits would be determined and would constitute estimated industry and key worker needs to be filled by risk area production in each region. National planners must also at this time review initial objectives and final demands to determine whether any allowable modifications could be made that would reduce risk-area industrial activities.

Revised guidance from the federal level would be provided to the local and regional planners for final implementation in the field. Local and regional planners would then conduct on-site investigations of risk area facilities and identify specific risk area facilities and production levels.

The planning steps presented in Figure 2 probably cannot be implemented with current planning resources at national, regional, and local levels. Hence, initial planning efforts might be limited to the steps involving national and regional sectors, with local participation consisting of provision of specific information as requested by upper-echelon planning groups. Until local assistance was made available, this procedure would minimize the on-site detailed inputs to the planning system.

Final Demands

Normal and subsistence consumption for the United States on a per capita basis has been previously developed[4], and more recently, efforts have been made to specify survival items for evacuees and host area populations[5]. Previous investigations by Sachs and Leavitt are useful for identifying essential industries and services for crisis relocation and postattack recovery support[6,7,8] according to name of industry or service and Standard Industrial Classification (SIC) code. A more lavish level of relocation support is prescribed by Billheimer, Jones, and Myers[3] for the food industry and is extended by Devaney and Strope[5] in their guidance for state planners. The general categories of essential goods and services that have been developed for postattack studies[9,10] have also some application to the crisis relocation problem; however, the use of government services and their required levels could vary widely. Table 24 gives the general categories of goods and services needed for the crisis relocation option and distinguishes the categories that would likely require extensive new production from those that could be supplied principally from inventories.

For the objective of crisis relocation support, increased use of transportation and associated fuel could be expected primarily to support the daily transportation of key workers in and out of the risk areas. Heavy use of construction materials and construction equipment could also be expected to modify facilities occupied by evacuees and to provide protective measures for all of the population. Higher activity levels in the public health service, health supplies and equipment, water,

Table 24

ESSENTIAL INDUSTRY REQUIREMENTS

SUPPORT RELOCATION	PRODUCTION	INVENTORY
FOOD PRODUCTS AND SERVICES	X	X
HEALTH SUPPLIES AND EQUIPMENT	X	X
CLOTHING		X
ELECTRIC POWER	X	
FUEL PRODUCTS AND SERVICES	X	X
WATER, SANITATION, & SEWAGE TREATMENT PRODUCTS & SERVICES	X	X
CONSTRUCTION MATERIALS, EQUIPMENT AND SERVICES	X	X
TRANSPORTATION SERVICES	X	
TELECOMMUNICATIONS SERVICES	X	
FINANCIAL SERVICES	X	
GOVERNMENT SERVICES	X	
HEALTH AND MEDICAL SERVICES	X	
WHOLESALE & RETAIL SERVICES	X	
MISCELLANEOUS EMERGENCY PRODUCTS (BATTERIES, ETC)	X	X
POST ATTACK RECOVERY ADD:		
PRODUCER EQUIPMENT AND COMPONENTS	X	X
INDUSTRIAL FACILITY COMPONENTS	X	X
INSTRUMENTS	X	X
OTHER LOGISTIC SERVICES	X	
SELECTED NON DURABLES	X	X
MILITARY SUPPORT ADD:		
ORDNANCE	X	X
OTHER MILITARY EQUIPMENT AND SUPPLIES	X	X
BASIC INDUSTRIAL SECTORS	X	X

sanitation, and sewer sectors could be expected to meet the needs of the evacuees. Demands for government and financial services would remain high in order to maintain a going economy in the CR-Maintenance Phase.

The postattack recovery objective would introduce additional changes in the demands on the various essential categories of goods and services. While the complete description of this option is yet to be developed, some characteristics are evident. There would be an extensive effort to relocate essential equipment and stockpiles into non-risk areas, creating heavy demands for all forms of transportation and warehousing. Demands would also include the production of items critical to recovery: producer equipment, key power transmission components (e.g., transformers), petroleum refinery equipment and components, etc.

Military demands would be developed by cognizant DOD agencies. The facilities engaged in end item production would be identified by the military agencies. The Office of Industrial Mobilization of the Dept. of Commerce in cooperation with the Dept. of Defense derives priority lists for industrial production in wartime situations. OIM is also concerned with other industrial problems such as strikes that could affect overall production of critical items in a mobilization situation. The Dept. of Commerce maintains the Critical Industrial Facilities List, and DOD maintains the Key Facilities List.

The general economy would have additional demands placed on it for supporting services for military production, such as transportation, utilities, and government and financial services. Unless the CR-Maintenance Phase was prolonged or started well after the military buildup, production of input items to prime military contractors probably would not be needed. For purposes of determining status, production facilities currently producing military equipment can be divided into (a) those whose product would be completed in time to affect the current or anticipated crisis, and (b) those whose product would not be completed in time. Military has both "pre-positioned" and CONUS reserves that could sustain military operations for a significant period of time relative to the length of the CR-Maintenance Phase.

A number of industries listed for postattack and military production are actually not essential if the lowest cost option (most austere) of level of support were selected as the policy for the prevailing crisis. Apparently no investigation has yet been reported to define this "most austere" relocation effort in terms of all essential survival items. Such a list would at least include wheat production and wheat processing (to produce edible bulgar); the dairy industry and production of dried milk; the water supply service; the sanitation service; the fuel supply and fuel production; the transportation to implement the relocation and to transport the food to the hosting areas; and the construction materials and equipment needed to construct the needed shelter spaces.

The Basic Production Model

The process of determining required activity levels in various industries given user demands has often made use of input-output models. The input-output model is based upon a series of technological coefficients or multipliers, each one of which represents a fixed relationship between the activity level of industry and the input requirements from another industry. A set of equations based on such coefficients can be used to estimate activity levels in all sectors of the economy for any given set of final demands. In addition to its general use to study problems in the economy, the input-output model has been used for many years in the study of postattack recovery and other emergency situation at the national and at the regional level[11]. An I-O Model adapted for use in the crisis relocation problem is presented in Appendix B.

The utility of I-O depends upon the availability of coefficients, or data to calculate coefficients, at the right level of detail with respect to industry sectors and economic areas. For the crisis relocation problem, it will be necessary to: (a) separate industry into risk and non-risk areas within a given region, and (b) provide industry data at a sufficient level of detail (4-5 digit SIC) to permit identification of specific plants that might be candidates for essential production. Data at this level of detail are collected by the Bureau of the Census and a portion of it is published in the Census of Manufacturers, but some

portions for local and regional areas are held back under confidentiality provisions. The data do exist, however, and have been provided to other government agencies under proper safeguards. Methods of using national data to approximate regional I-O factors have also been suggested[12].

An often overlooked consideration of importance related to the use of I-O models is the relevance of the basic I-O coefficients themselves to the specific economic situation under study. Each coefficient represents a mix of production processes, and any change in the mix (as in using the product of some plants in the SIC category but not others) can introduce changes of unknown magnitude into the coefficient. This consideration is one reason to take coefficients at the most detailed level possible. Also, the input when expressed in dollar terms represents imputed costs of the item when produced at normal rates and accompanied by secondary or joint products, and other factors that normally lower unit production costs. Thus, when presenting coefficients for use under unusual circumstances, it is desirable to translate them into physical quantities rather than economic units. Technological coefficients would also change over time as the mix of processes, efficiencies, and inputs changes. However, in crisis relocation, which would be of relatively short duration, processes and even suppliers would have to remain about the same as under normal circumstances.

Even with careful development of coefficients, it is to be expected that considerable error would remain in estimates of required activity levels. Consequently, the model would be most appropriate for studying the problems at the national level and for providing initial guidance to local and regional planners. On-site visits of the latter would be needed to obtain more complete and accurate findings about local industrial requirements and capabilities, as is suggested by the previously described planning process.

Local and Regional Planning

The national level would provide initial guidance and data so that local and regional planning could proceed efficiently. The results of the basic production would indicate initial estimates of required levels of production

in essential industrial sectors, and indication of possible capacity deficits in host areas. The national level could also provide a listing of plant identifications in host and risk areas as a basis for initial local on-site contacts. Dunn and Bradstreet data currently available to DCPA list information on about 80% of all industrial establishments (i.e., about 3 million facilities). Data fields in this source give primary product (4-digit SIC), secondary product (incomplete), address, telephone, principal officer, number of employees, volume of business, minor civil division, county, city, and state[13].

Local and regional planning would provide the detailed information not supplied by national data and would involve individual facilities directly in planning. On-site visits would be undertaken to examine general suitability of the facilities and organizations, and unique capabilities and requirements. The capability of the facility to continue operations in absence of regular suppliers and other support would be important considerations. Key workers for the required production would be determined during this control planning stage.

The national level would also provide the local and regional planners with detailed survey instruments to be used in gathering facility data in a systematic manner. While the design and testing of such instruments is a major undertaking, some of the principal data types would include the following:

- Present and other feasible production levels of essential goods and services.
- Current backlogs.
- Inventories of finished and in-process production items and of input items.
- Essential support for runout production.
- Anticipated cost changes associated with other production levels and distribution systems.
- Normal markets for products or services (type and location).
- Key workers (number and types).
- Normal and possible alternate work schedules.
- Financial requirements for normal and emergency production.
- Other constraints on operations (e.g., labor agreements, government regulations, other contractual arrangements).

Coordination of field activities would be advisable with other agencies that are concerned with industrial production in an emergency, notably the Defense Supply Agency (DSA); Office of Assistant Secretary of Defense (OASD) Material Acquisition; the Office of Industrial Mobilization (OIM) of the Department of Commerce; and other agencies such as DEPA[15]. The Department of Defense maintains an Industrial Preparedness Program which has registered between 10,000 and 12,000 facilities as planned emergency producers of defense related products[16]. DOD also maintains a key facilities list of over 3,000 defense related facilities. DOD uses an industrial facility survey instrument[17] to collect a variety of information on production, including some of the items that would be needed in a survey to identify essential industry for crisis relocation. The data, however, do not include key worker categories. DOD maintains Armed Services Production Planning Officers (ASPPO) at every local contract office to provide on-site assistance to current and potential defense producers. The Office of Industrial Mobilization also conducts detailed surveys of critical items associated with mobilization. OIM together with DOD sets priorities on industrial production both before and after mobilization.

These agencies should be able to provide considerable knowledge and assistance relating to any extended on-site survey of industry for crisis relocation planning. However, current data from these sources is primarily for defense production. Consequently, much of the data for essential production and service areas in the CR-Maintenance Phase would have to be obtained in a new survey (e.g., food production, sanitation, financial and government services, etc.).

Local and regional planners would review on-site data together with guidance provided from the national level and devise a preliminary plan. General steps in this process would include:

- Review on-site data and determine adequacy of host area production.
- Identify deficits between production goals and host capacity.
- Identify normal sources of supply (another region, risk area, etc.).

- o Select specific risk area facilities to be earmarked for essential production.
- o Determine supporting service requirements for risk area production.
- o Determine key workers for risk area production.

Every effort should be expended to make use of inventories in lieu of further production. Use of manufacturers' inventories should eliminate the need for secondary supplies over a considerable period. For example, studies in the steel industry have shown little effect on the GNP for about five weeks. In specific industries directly dependent on the steel industry (e.g., machinery, motor vehicles, etc.), production was estimated to have been reduced by only 25% after a five-week strike[17]. Also, the ratio of retail inventories to average monthly sales is about 2.22 for durable goods, and 1.23 for non-durables (1974). So on the average inventories would meet peacetime demands for a period of a month or longer[1*].

Resulting preliminary plans together with detailed facility data in standardized formats would then be forwarded to the national level for further analysis and reconciliation.

National Level Review of Local and Regional Plans

The national level planning will be concerned with the equitable sharing by localities and regions of the available resources and likely risks associated with crisis. In reviewing local and regional plans, the national level will therefore be concerned that:

- o Plans meet initially stated production and supply goals
- o No inordinately high level of key workers is exposed in any given risk area or region.
- o Interregional demands are reasonable and can be met.
- o Host area capacities are being used to the maximum feasible extent.
- o Proper account is made of finished goods inventories in reducing required production activities.
- o Needs for supporting services have been considered.
- o Other regional and local constraints have been considered.

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*Table 813, Statistical Abstracts. Also, from Table 1252, manufacturers' inventory to sales ratios were 2.07 for durables and 1.20 for non-durables.

The reduction, summarization, and use of detailed facility data would be a sizeable undertaking and would require the attention of a substantial field staff. Part of the earlier efforts in planning at the national level would be to determine appropriate approaches to reduce the magnitude of demands placed on field staffs. For instance, it might be appropriate to limit on-site surveys to only the larger facilities and use statistical data from mail survey to assess the capability of small facilities.

The satisfaction of interregional demands would be an allocation problem of considerable complexity. It shares many of the same characteristics as postattack industrial planning or military logistics planning in general. However, it has its own unique aspects. In particular, for the CR industrial allocation problem, consideration must be given to established procedures and infrastructures that would continue to influence operations during the CR-Maintenance Phase. The basic structure of the allocation problem would allow application of mathematical optimizing approaches such as linear programming. However, since the problem is not as yet well-understood and the data do not yet exist to support a mathematical solution, a heuristic planning procedure would appear initially more useful.

The rules associated with a heuristic approach would develop in the course of examining the plans provided by the regions. However, some general rules can now be stated. Planners would want to retain normal sources of regional and interregional supply to the extent possible, for both technological and contractual reasons. A consumer or intermediary might be set up to handle a specific producer's goods and might have to change his equipment or procedures to handle another producer's goods (e.g., quality or concentration of the input product could differ, requiring changes in mixture proportions, containers might differ in size and shape, etc.). Intermediaries and consumers might already have contractual arrangements with producers that oblige them to use the producers' products. Shipping schedules might also be an important factor that would not be met with another supplier.

Where shortages exist in the interregional and regional supplies, decisions would have to be made on how to allocate the existing supply. A

number of heuristics for resolving this problem would have to be examined carefully against the existing situation. In general, it would appear preferable to allocate in proportion to the need of each region rather than to seek a "least cost" solution.

If shortages were excessive and required inordinate levels of exposure of key workers over the United States, national planners might wish to consider possible reduction in final demands of the population as well as demands associated with CR postattack recovery and military support. Any adjustments could then be translated into reduced production levels for each region, and changes in local and regional plans could be made accordingly.

With the allocation of interregional capacity and any changes in production requirements, the national level planner would be in a position to reformulate the basis of local and regional plans. This step would include:

- Required changes in use rates of risk and non-risk area industry.
- Suggested substitutions in demand for products to conform with existing capacity and inventories.
- Augmentation of local and regional capacity with federal, state, and interregional resources.
- Modifications of regulations and contracts to permit higher levels of production.
- Changes in required production rates.
- Requests for justification of proposed types, levels, and locations of production and associated key workers.
- Changes in the use of existing finished and in-process inventories.

Completion of Local and Regional Plans

On return of initial plans from the national level, local and regional planners would endeavor to implement the recommended changes. Planning would include a final selection of risk area essential industry, a setting of specific facility production goals in both risk and non-risk areas, a final determination of system support (e.g., utilities, transporation, etc.), and a revised estimate of key workers. Planners would also undertake to

assure that the essential industry plans were fully integrated into the overall crisis relocation plans for the region, including provision of relocation housing for key workers, maintenance of the continuity of the organizations associated with essential industry facilities, etc.

Local and regional planners would also be required to render assistance to firms with essential facilities in developing individual facility plans for response to crisis relocation. Individual facility plans should include information on:

- o Production goals
- o Conditions under which emergency procedures are initiated
- o Procedures for converting to emergency production
- o Organizational responsibilities and key workers
- o Distribution systems and schedules
- o Support requirements and sources
- o Coordination and reporting requirements
- o Relationship to the overall regional CR plan.

Final local and regional plans would be forwarded to the national level for final review. At subsequent intervals, local and regional planners would forward status reports on local and regional plans and on the development of facility plans. The planning process should include several CR alternatives, objectives, and degree of system austerity that are deemed reasonable and practical at any particular time by the national planning staff.

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VI. ESTIMATION OF ECONOMIC IMPACT IN THE AFTERMATH OF CRISIS

General Background

Regardless of measures taken to control economic problems during crisis relocation, substantial losses to the economy are inevitable. These losses would be greater than those historically associated with a natural disaster, but certainly much less than those associated with a major war. Losses up to the beginning of the CR-Reconstitution Phase would probably be of the order of tens of billions of dollars. While these losses could be absorbed by the economy, prompt actions would be required to prevent continued economic dislocation in the subsequent period.

Major questions include the distribution of these losses among specific economic sectors and the ability of the economy to absorb these losses without unacceptable increases in interest rates and unemployment, or losses in GNP, personal income, consumption, and other unfavorable outcomes. Much would depend upon the government measures taken in the crisis relocation aftermath to control and ameliorate the impact of the initial losses. Final decisions relating to government measures may not now be possible; however, future decisions would be enhanced by establishing the general dimensions of the initial losses, and by analyzing the impact of such losses on the recovery in subsequent periods. Such information would also allow assessment of the relative effectiveness that could be expected from alternative economic policies designed to increase the pace of recovery after crisis relocation.

Appraisal of the ultimate economic impact can proceed by making estimates of the initial economic conditions after relaxation of CR and then tracing the resulting impact of these conditions through the economic system. This approach requires the use of economic models that allow prediction of economic effects over time.

Approach for Estimating the Economic Impact of Crisis Relocation

The changes in the income, expenditures, and assets of various individual economic units, when taken in the aggregate, constitute the economic losses initially sustained by the national economy from crisis relocation. The approximate overall impact can be determined for any given CR scenario by examining the specific impact of losses on various economic sectors (e.g., individual, business, etc.). The basic steps in the analysis of the economic impact are:

(1) Develop crisis situations and identify major characteristics of alternative scenarios that have an impact on the economic sectors.

(2) For each of the various crisis scenarios, determine the extent of the economic disruption and loss for each economic sector during each of the crisis phases.

(3) Relate the economic loss for each major economic sector to various aggregate measures of the national economy and determine the economic consequences of these losses.

(4) Analyze the relative effectiveness of alternative governmental policies in ameliorating losses incurred by major economic sectors during the crisis phases.

(5) Determine policies that best contribute to the recovery of the national economy.

Since the economic impact of crisis relocation is highly dependent on the events before and during relocation of the population, it is necessary to identify the major characteristics of alternative scenarios that affect income, expenditure, and assets of the economic units. Relevant characteristics include the intensity of the crisis confrontation, the length of the crisis buildup phase, the degree of implementation of crisis relocation, the length of the relocation maintenance phase, the nature of economic activity during the maintenance phase, and the extent of delays in resuming pre-crisis levels of economic activity. These characteristics in varying degrees determine the extent of economic losses on the specific economic sector.

Once the characteristics of alternative crisis scenarios have been identified, an analysis can be undertaken of the extent of the economic loss on each major economic sector during each of the crisis phases. The magnitude of the disruption to, and resultant loss on, each economic sector during each of the CR phases can be determined in such terms as work time lost; production lost; reduction in earnings; buildup of obligations; reductions in profits; changes in personal and business savings; losses in income of businesses; and reduction in the amount of individual, business, and local government liquid assets.

Once the extent of the economic disruption and loss on each major economic sector has been analyzed, then consequences are related to various aggregate measures of the national economy. An econometric model (described in the following section) can be used to assess the economic consequences of the losses incurred on GNP, consumption, investment, and credit market behavior. The model explicitly recognizes important interactions occurring in an economic system. The model also allows the determination of the transient effects of the initial losses. These effects could influence the course of the economy for many months or years.

Econometric Model for Examining Economic Impact

A variety of large-scale econometric models are used by various federal agencies and other public and private organizations to forecast the nation's economy. These models are systematically used to assess the impact of monetary and fiscal policies and, at times, to assess the likely impact of specific economic disruptions such as the recent oil embargo and coal strikes. Although an existing large-scale model could have been used to analyze the economic impact of crisis relocation, the model would not have allowed the assessment of widely differing policies that are scenario dependent within the constraints of available time and resources.

A simplified econometric model has been developed specifically for the purpose of studying economic impact in the crisis aftermath. The model is sufficiently representative of the nation's economy to allow a consistent screening of various policy options in terms of the transient impact on the economy.

Table 25 summarizes the various macro-economic variables that are used in the econometric model. Some variables are characterized as endogenous variables. This means that they are postulated to be jointly dependent on each other as well as being affected by other variables. The endogenous variables are the object of the explanation sought by the economic model. Lagged endogenous variables are endogenous variables that affect the jointly dependent variables but with a time lag. Other variables are characterized as exogenous variables. This means that they are postulated to have an impact on the economic system, and to affect the endogenous variables, while not being affected by them. Lagged exogenous variables are exogenous variables that affect the system but with a time lag.

Table 25

DESCRIPTION OF THE VARIABLES COMPRISING THE MODEL

Variable	Description	Symbol
Endogenous		
Consumption[a/]	Total consumption expenditures	CON
Investment	Gross private domestic investment	INV
Price change measure[a/]	Percentage change in gross national product deflator, an index which measures the average prices of all goods and services domestically produced.	PCH
Demand for credit funds	Total funds advanced to the nonfinancial sectors in credit markets	DCF
Availability of credit funds	Total funds raised in credit market by nonfinancial sectors	ACF
Interest rate[a/] measure	A weighted index representing bond yield and interest rates	INTR
Gross national[a/] product gap	Difference between capacity gross national product and actual gross national product	GNPG
Disposable income	Total after-tax income received by household from productive activity or transfer payments	DINC
Government budget surplus[a/]	Total dollar excess of receipts over expenditures by the federal, state and local governments	GBS
Exogenous		
Labor force time lost measure[a/]	Man-hours lost by the unemployed and persons on part-time for economic reasons as a percent of potential available labor forces man-hours	LFTL
Personal savings measure	Percent of disposable personal income that is saved	PSA

Table 25 (Concluded)

Variable	Description	Symbol
Exogenous (continued)		
Business savings measure	Ratio of the total of capital consumption allowances plus undistributed profits less inventory evaluation adjustment to gross national product	BSA
Corporate profitability measure[a/]	Percentage change in the ratio of manufacturing corporations profits after taxes to stock holders equity	CPR
Total tax measure	Ratio of the total of indirect business taxes, corporate tax liabilities, social security contributions and personal tax payment to gross national product	TTA
Government transfer payments	Transfered interest payment to persons by federal, state, and local governments	GTP
Member bank required reserves	Total member bank required reserves on deposit with Federal Reserve Bank + vault cash	MBRR
Government expenditures	Purchases of goods and services by federal, state, and local governments	GEXP
Exports less imports	Exports of goods and services less imports of goods and services	NEX
Capacity gross national product	Dollar value potential of gross national product under conditions of full employment	GNPC
Consumer interest payment	Interest paid by consumers	CIP
Subsidies less agency surplus	Subsidies less current surplus of government enterprises	SAS

a/ = These variables also occur as lagged variables.

The econometric model consists of a system of stochastic equations (each equation is not an exact relationship but is subjected to random disturbances) that must be simultaneously solved. The equations making up the model are given below in symbolic form. (The detailed specification of the equation is included in Appendix A.)

EQUATION 1

CON = f (PCH, DINC, LCON, LFTL, LLFTL) plus a random error.

Equation 1 states that the current level of consumption expenditures depends on current price changes, on the current level of disposable income, on the recent level of consumption, on the current extent of lost labor time, and on the recent extent of lost labor time. Other considerations affecting the current level of consumption are included in the error term.

EQUATION 2

INV = f (ACF, INTR, GNPG, BSA, LCPR) plus a random error.

Equation 2 states that the current level of investment depends on the availability of credit funds, on the current interest rate, on the current level of the GNP gap, on the extent of business savings, and on the recent corporate profitability. All other considerations affecting current investment are included in the error term.

EQUATION 3

PCH = f (GNPG, LGNPG, LPCH, GBS, LFTL, LLFTL) plus a random error.

Equation 3 states that current price changes depend on both current and recent levels of the GNP gap, on recent price changes, on both current and recent levels of government budget surplus, and on both current and recent extent of lost labor time. All other considerations are included in the error term.

EQUATION 4

DCF = f (INTR, DINC, LPCH, PSA, BSA, LLFTL) plus a random error.

Equation 4 states that the current demand for credit funds depends on the current interest rate, on the current level of disposable income, on recent price changes, on the current extent of personal savings, on the current extent of business savings, and on the recent extent of lost labor time. Other considerations affecting the current demand for credit funds are included in the error term.

EQUATION 5

ACT = f (INTR, CPR, LCPR, MBRR, LGNPG) plus a random error.

Equation 5 states that the current availability of credit funds depends on the current interest rate, on the current corporate profitability, on the current level of required reserves of banks, and on the recent level of the GNP gap. Other considerations affecting the current availability of credit funds are represented by the error term.

EQUATION 6

INTR = f (PCH, DCF, ACF, LINTR, LGBS) plus a random error.

Equation 6 states that the current interest rate depends on the current price changes, on the current demand for credit funds, on the current availability of credit funds, on the recent interest rate, and on the recent government budget surplus. The error term represents all other considerations affecting the current interest rate.

The three remaining equations are algebraic identities and are introduced to complete the system of equations. These equations are shown in Appendix A.

Testing the Validity of the Econometric Model

The econometric model was exercised on a computer to establish its validity as a representation of a complex economy. National annual data for the period 1955 through 1974 were used. All dollar quantities were expressed in real dollar terms. Almost all of the estimated parameters of the various equations were shown to be highly significant. Moreover, the degree of explained variation turned out to be high. The lowest degree of explained variation was slightly in excess of 80%, and was associated with the price change equation. These results demonstrated the validity of the model for purposes of analyzing the post-crisis impact of the relocation on the economy in the absence of an attack.

Further Use of the Econometric Model

The inherent dynamic nature of the model allows an analysis of the impact of sudden shock to the economy. Hence, it is possible to study the time paths and changes over time of the endogenous variables in the system resulting from certain changes to one or more exogenous variables in the system.

Further Development of the Econometric Model

Refinement can certainly be incorporated into the model. However, before unduly complicating the model, an analysis of its validity when applied to quarterly data of economic activity should be undertaken. If its explanatory power remains high, additional refinement need not be undertaken. The inherent tradeoff between the added complexity and understandable interpretation should be settled on the side of understandable interpretation.

APPENDIX A

ECONOMETRIC MODEL FOR ESTIMATING IMPACT OF NATIONAL EMERGENCIES

APPENDIX A

ECONOMETRIC MODEL FOR ESTIMATING IMPACT OF NATIONAL EMERGENCIES

ECONOMETRIC MODEL

This appendix presents the mathematical relationships that define the econometric model for assessing the impact of crisis relocation upon the national economy. The model allows the gross assessment of major national economic indicators such as consumption, gross investment, disposable income, etc. (endogenous variables) in terms of a number of other aggregate indicators (exogenous variables).

The coefficients of the linear equations making up the model were obtained applying two-stage regression analysis and using annual national statistical data covering the period 1955 to 1974. The matrix of coefficients so obtained is rearranged to provide matrices of multipliers that allow determination of the values of the endogenous variables for any set of values of the exogenous variables. This analysis will be used to analyze the economic impact of various scenarios and government policies.

LIST OF VARIABLES

Symbol	Description	Unit: Billions a/ of Dollars	Unit: Ratio or Percent	Lagged Endogenous	Lagged Exogenous	Occurs in Equation
Endogenous						
CON	Consumption	o		x		1, 7
INV	Investment	o				2, 7
PCH	Price change measure		o	x		1, 3, 4, 6
DCF	Demand for credit funds	o				4, 6
ACF	Availability of credit funds	o				2, 5, 6
INTR	Interest rate		o	x		2, 4, 5, 6
GNPG	Gross national product gap	o		x		2, 3, 5, 7, 8, 9
DINC	Disposable income	o				1, 4, 8
GBS	Government budget surplus	o		x		3, 6, 9
Exogenous						
LFTL	Labor force time lost measure		o		x	1, 3, 4
PSA	Personal savings measure		o			4
BSA	Business savings measure		o			2, 4, 8
CPR	Corporate profitability measure		o		x	2, 5
TTA	Total tax measure		o			8, 9
GTP	Government transfer payments	o				8, 9
MBRR	Member bank required reserves	o				5
GEXP	Government expenditures	o				7, 9
NEX	Exports less imports	o				7
GNPC	Capacity gross national product	o				7, 8, 9
CIP	Consumer interest payments	o				8
SAS	Subsidies less agency surplus	o				8, 9

a/ = Dollars in real purchasing power.

VARIABLES AND CORRESPONDING COEFFICIENTS

Endogenous		Lagged Endogenous		Exogenous		Lagged Exogenous	
Coefficient	Variable	Coefficient	Variable	Coefficient	Variable	Coefficient	Variable
β_1	CON	γ_1	LCON	δ_1	LFTL	θ_1	LLFTL
β_2	INV			δ_2	PSA		
β_3	PCH	γ_3	LPCH	δ_3	BSA		
β_4	DCF			δ_4	CPR	θ_4	LCPR
β_5	ACF			δ_5	TTA		
β_6	INTR	γ_6	LINTR	δ_6	GTP		
β_7	GNPG	γ_7	LGNPG	δ_7	MBRR		
β_8	DINC			δ_8	GEXP		
β_9	GBS	γ_9	LGBS	δ_9	NEX		
β_{10}	$(ACF_{cal}-DCF_{cal})$			1	GNPC		
				1	CIP		
				1	SAS		

The coefficient β_{10} is added to accompany the fitted function, the difference of the calculated values of ACF and DCF.

IDENTIFICATION OF LAGGED VARIABLES

$LCON_t = CON_{t-1}$

$LPCH_t = PCH_{t-1}$

$LINTR_t = INTR_{t-1}$

$LGNPG_t = GNPG_{t-1}$

$LGBS_t = GBS_{t-1}$

$LLFTL_t = LFTL_{t-1}$

$LCPR_t = CPR_{t-1}$

MODEL EQUATIONS

The following equations define the nine endogenous variables used in the econometric model:

1. $CON = \alpha_1 + \beta_{13}PCH + \beta_{18}DINC + \gamma_{11}LCON + \delta_{11}LFTL + \theta_{11}LLFTL + \varepsilon_1$

2. $INV = \alpha_2 + \beta_{25}ACF + \beta_{26}INTR + \beta_{27}GNPG + \delta_{23}BSA + \theta_{24}LCPR + \varepsilon_2$

3. $PCH = \alpha_3 + \beta_{37}GNPG + \beta_{39}GBS + \gamma_{33}LPCH + \gamma_{37}LGNPG + \gamma_{39}LGBS + \delta_{31}LFTL + \theta_{31}LLFTL + \varepsilon_3$

4. $DCF = \alpha_4 + \beta_{46}INTR + \beta_{48}DINC + \gamma_{43}LPCH + \delta_{42}PSA + \delta_{43}BSA + \theta_{41}LLFTL + \varepsilon_4$

5. $ACF = \alpha_5 + \beta_{56}INTR + \delta_{54}CPR + \gamma_{57}LGNPG + \delta_{57}MBRR + \theta_{54}LCPR + \varepsilon_5$

6. $INTR = \alpha_6 + \beta_{63}PCH + \beta_{6,10}\left[ACF_{cal} - DCF_{cal}\right] + \gamma_{66}LINTR + \gamma_{69}LGBS + \varepsilon_6$

   NOTE: From data available, values exist only for ACF = DCF. Therefore, in Equation 6, the ACF and DCF data are replaced by ACF_{cal} and DCF_{cal}, values derived in Equations 4 and 5. The coefficient $\beta_{6,10}$ is defined as the coefficient of $\left[ACF_{cal} - DCF_{cal}\right]$.

The last three expressions, Identity Equations necessary to complete the system, are, by definition:

7. $GNPG = GNPC - CON - INV - GEXP - NEX$

8. $DINC = [1 - TTA - BSA][GNPC - GNPG] + GTP + CIP + SAS$

9. $GBS = TTA\ (GNPC - GNPG) - GEXP - GTP - SAS$

In standard linear form, Equations 7, 8, and 9 are shown below. Note that each coefficient in Equation (7) has a value of 1. The last two expressions were derived employing numerical differentiation in first-term Taylor's expansion of non-linear terms, using the theory of finite differences for functions defined on an interval containing a set of discrete points. Coefficients in Equations 8′ and 9′ are obtained by evaluating the coefficients of Taylor's expansion around suitably defined mean values.

7′. $GNPG = \alpha_7' + \delta_{7,10}'GNPC + \beta_{71}'CON + \beta_{72}'INV + \delta_{78}'GEXP + \delta_{79}'NEX$

8′. $DINC = \alpha_8' + \delta_{83}'BSA + \delta_{85}'TTA + \delta_{86}'GTP + \delta_{8,10}'GNPC + \beta_{87}'GNPG$

9′. $GBS = \alpha_9' + \delta_{95}'TTA + \delta_{96}'GTP + \delta_{98}'GEXP + \delta_{9\ 10}'GNPC + \beta_{97}'GNPG - SAS$

VECTOR OF ENDOGENOUS VARIABLES

Derivation:

The system of equations can be represented in matrix form, as follows:

$$Y_t = \nabla + BY_t + \Gamma Y_{t-1} + \Delta X_t + \theta X_{t-1} + \Psi_t.$$

Where Y_t = vector of endogenous variables

Y_{t-1} = vector of lagged endogenous variables

X_t = vector of exogenous variables

X_{t-1} = vector of lagged exogenous variables

∇ = vector of constants

B = Matrix of β coefficients

Γ = Matrix of γ coefficients

Δ = Matrix of δ coefficients

Θ = Matrix of θ coefficients

Ψ_t = vector of error terms

Rearranging terms, to define Y_t explicitly gives:

$$Y_t = (I-B)^{-1} \nabla + (I-B)^{-1} \Gamma Y_{t-1} + (I-B)^{-1}\Delta X_t + (I-B)^{-1} \theta X_{t-1} + (I-B)^{-1}\Psi_t.$$

Simplifying:

$$Y_t = K + AY_{t-1} + CX_t + DX_{t-1} + \mu_t^*.$$

Where $K = (I-B)^{-1}\nabla$

$A = (I-B)^{-1}\Gamma$

$C = (I-B)^{-1}\Delta$

$\mu_t^* = (I-B)^{-1}\Psi$

The multipliers used in determining impacts on the endogenous variables of changes in the exogenous variables are:

Impact multiplier = C

Interim multiplier = $A^{t-1}(AC+D)$ $t = 1,2,3$

Use of the Impact Multiplier in the expression:

$$Y_t = CX$$

provides a steady state result of the value of the vector Y, for values of each exogenous variable defined at the start of the time period.

Use of the Interim Multiplier allows calculation of the vector Y as a function of X at any time t for the original conditions defined for the Impact Multiplier.

In addition to the above multipliers, impacts on Y as a function of X, of cumulative values of the exogenous variables, as these values change with time intervals, can be calculated numerically.

APPENDIX B

INPUT-OUTPUT MODEL

FOR ESSENTIAL INDUSTRY

APPENDIX B

INPUT-OUTPUT MODEL FOR ESSENTIAL INDUSTRY

The basic industrial production model, as part of the rationale for identifying essential industry under any selected national or regional objective, consists of a series of input-output variables as floating operators. The operators serve as multipliers to output variables whose values are generally in terms of production, or product flow, rates. Thus, once a production rate of an item is established by some means, multiplication by an input-output coefficient gives the required flow rate of an input item. In a sequential pattern, the input is an output of a previous process in a series.

For many processes, the mathematical representation of the input-output coefficient relationship for a major product and several input products, in linear form, is given by

$$\dot{I}_{kp} = a_{ikp}\dot{O}_{ip} \tag{1}$$

in which $\dot{I}_{kp}$ is the input rate of the kth input product; a_{ikp} is the respective input-output coefficient; and $\dot{O}_{ip}$ is the output rate of the ith product by process p. However, in the data used to evaluate the a_{ikp} coefficients, the reference is to a whole industry as designated by the respective 4-digit SIC code of the Bureau of Census data on manufacturers; specific plants and processes are then not considered specifically in the application of Equation 1. In general, $\dot{O}_{ip}$ refers to the total output of the industry, including inter-industry shipments. The latter are considered as inputs to the same output product only when shipments to another area of consideration are involved (i.e., as from one state to another). The production of most major products includes the simultaneous production of by-products and/or waste-products; the production rate of these items can often be represented as being proportional to the production rate of the major product, or

$$\dot{O}_{(i+1)p} = b_{(i+1)p}\dot{O}_{ip}. \tag{2}$$

The values of $\dot{I}_{kp}$ and $\dot{O}_{ip}$ may be expressed in terms of daily, weekly, monthly, quarterly, or yearly average rates, as desired. They may represent either gross productivity for a given region or the per capita productivity

rates under the prevailing conditions of the region. The total production rate of the ith product and the total consumption or use rate of input k in a given region are estimated from the sum of $\dot{O}_{ip}$ and $\dot{I}_{kp}$ over all plants in region r that produce product i or use input k.

At each successive stage in the chain of sequential processes, going from a final (consumed) product to an original resource, the input, $\dot{I}_{kp}$, converts to an output, $\dot{O}_{ip}$, of the next previous step in the chain of processes in the production of the final product. Hence, the method does not entail a complete solution of an econometric matrix but rather consists of a series of partial solutions whose sum gives the required level of activities in all sequential needed manufacturing processes.

Further, for the problem under consideration, which is short-term in conception, the input-output model must be concerned only with a sort of short-term contraction of functions. This process involves:

(1) The short-term stoppage of production of certain selected non-essential goods.

(2) The delay or stoppage of production of certain essential goods whose inventories are more than sufficient to supply demands over a short period of time.

(3) The stoppage of production in risk areas for products whose output in the short-term from non-risk areas is sufficient to meet an emergency-allocated demand (in combination with step 2 above).

These considerations, taken together, indicate that it is not feasible to use a conventional matrix-system approach to the solution of the essential industry problem concerning the support of a relocation effort. A new matrix system (which is unlikely) could be used to deduce a desired solution to the problem of requested manufacturing activity level, provided that the altered flow rates of products, resources, and energy were formulated as the outcome of the sequential patterns in the various product chains.

In a developing crisis, the actual output of plants in hosting areas could be gradually increased by adding manpower and by giving such plants priority on available inputs to assure a production rate at maximum rated capacity of these plants. Alternatively, the production rate of similar plants in risk areas could be slowed down with transfer of personnel and

inputs to the hosting area facilities. Input supplies could even be stockpiled in the hosting area as needed to assure some postattack production capacity. Even for production plants in the risk area, it may be more efficient, in use of manpower, energy, input materials, and transportation, to attempt to supply the needed output with a few plants operating at full capacity and close others down.

For the crisis relocation situation or a crisis relocation followed by nuclear attack, the final demand for survival items will depend on, and be proportional to, the product of an allowed per capita use or consumption rate of item i and the number of people in the region r (i.e., host area). Thus the final demand rate for product i in region r is defined by:

$$\dot{D}_{ir} = \dot{C}_i N_r \tag{3}$$

where $\dot{C}_i$ is the consumption rate at a specified level in some physical unit of measure per person per unit time (e.g., in lb. per capita per day) and N_r is the number of consumers in region r at the time for which the demand rate is to be evaluated. It is emphasized that the consumption rate, $\dot{C}_i$, is the major control variable for determination of essential products, industries, and quantities of products that would be needed to support a relocation effort along with one of its objectives. The definition of $\dot{D}_i$ refers only and specifically to the final demand or consumption rate of item i, for instance, as may be inferred to retail sales of food, clothing, and other such items. This aspect is extremely important with respect to crisis relocation planning situations where certain adjustments in production rates of many products are to be anticipated. An approximation of the total demand for product i may be obtained from a sum of $\dot{D}_i$ and all evaluated input demands ($\dot{I}_i$) or requirements of all sequential (product-flow) systems considered involving product i. It is clear that $\dot{C}_i$ or $\dot{D}_i$ could not be utilized uniquely as the means of specifying the resource allocation constraint for product i if it represented total rather than only final consumer demand.

For a plausible crisis relocation period, the approximate material balance constraint for many products could be represented by:

$$\dot{S}_{ir} = \dot{O}_{ir} + \dot{M}_{ir} - \dot{E}_{ir} - \dot{D}_{ir} \tag{4}$$

in which $\dot{S}_{ir}$ is the rate of increase of the supply of product i in inventories

or storage, $\dot{M}_{ir}$ represents the import rate, and $\dot{E}_{ir}$ represents the export rate. If the rates of Equation 4 are constant, or are are assumed to remain so, over a given period of time, the net increase in inventory, or supply, of product i in region r would be defined by

$$S_{ir} - S^{o}_{ir} = (\dot{O}_{ir} + \dot{M}_{ir} - \dot{E}_{ir} - \dot{D}_{ir})\ \Delta t \tag{5}$$

in which Δt represents the length of time period of interest and S^{o}_{ir} is the supply at the start of the period. If, for any reason, the output of product i, $\dot{O}_{ir}$, goes to zero and if transport is not readily available so that $\dot{M}_{ir}$ also becomes zero ($\dot{E}_{ir}$ would normally be assumed to be zero whenever $\dot{O}_{ir}$ is zero), the change in supply would gradually decrease according to

$$S_{ir} - S^{o}_{ir} = -\dot{D}_{ir}\Delta t \tag{6}$$

and the time period over which the supply (i.e., inventories) would last the population* in the region coincides with the time at which S_{ir} becomes zero, or

$$\Delta t(\max) = S^{o}_{ir}/\dot{D}_{ir}. \tag{7}$$

In any region or situation where Δt for a given survival product would be expected to be less than an anticipated relocation period (short of war), continued production of that product would be a necessity. In the case of an attack, Equation 7 represents the time after attack at which production of the ith item must be restored. This is not a rigorous requirement, of course, since the value of $\Delta t(\max)$ may be increased by decreasing the previously accepted or allowed consumption rate, or by moving people out of one region to another, where the supply is greater (if such a region exists). For the latter alternative, $\Delta t(\max)$ would indicate the time at which the time at which the movement should be concluded. Also, policy may not allow complete depletion of available inventories.

Initial estimates of survival items for evacuees and host area populations have been made[1,2]. On the basis of prior U.S. per capita consumption rates[3], maintenance of the population during crisis relocation would indicate a per-capita dietary intake in excess of 3,000 calories per day. However, for crisis relocation plus later attack survival and postattack re-

*The same relationships would apply to industries, services, and military consumption rates of products. See references on next page.

covery over a limited period of time, a survival level of half the average calorie intake would likely suffice.[4] Even so, a selected level of intake of 1,500 to 3,000 or more calories per day would be a matter of national and regional decision at the time of the crisis.

The consumption demand constraints and the deduced product output and input requirements are first derived on the basis of the nation as a whole, and then for the region of interest. In case of national emergency conditions of undefined causes, it would be prudent in planning to consider production requirements first for the case in which $\dot{M}_{ir}$ and $\dot{E}_{ir}$ are zero, and then for the worst case where, as in Equation 4, the value of $\dot{S}_{ir}$ goes to zero. At that condition of change in supply of item i, it may be decided that the output rate, $\dot{O}_i$, be set equal to the demand (or gross consumption) rate, $\dot{D}_i$, and hence the relative level of total inputs required are related to the demand rate by

$$\dot{I}_{kp} = a_{ikp}\dot{D}_i. \tag{8}$$

Thus, for dire emergency conditions, the approximate required input rate of the kth input product from process p is determined by multiplying the established final demand, or consumption, rate for product i by the respective input-output coefficient.

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1. Guidance of Priority Use of Resources in Immediate Postattack Period, Defense Mobilization Order 8500.1A, Office of Emergency Planning, November 1964.
2. John F. Devaney and Walmer E. Strope, Draft Guidance for Development of a State Crisis Relocation Plan, TN3479-11, Stanford Research Institute, May 1975.
3. Carl F. Miller, Resource Allocation Concepts, URS Research Company, May 1970.
4. U.S. Department of Agriculture, USDA Defense Operations Handbook, June 1972 and October 15, 1975.

APPENDIX C

DATA AND DATA SOURCES

FOR INDUSTRIAL

INPUT-OUTPUT SYSTEMATICS

APPENDIX C

DATA AND DATA SOURCES FOR INDUSTRIAL INPUT-OUTPUT SYSTEMATICS

Primary sources of data for the input-output industrial requirements model whose end-product is an estimate of required outputs and inputs to achieve a stated relocation objective for the nation as well as for separate local regions include all the publications of the census bureau. Other sources include texts on chemical and engineering processes and industrial production summaries. The purpose of this particular investigation does not include the provision of all the evaluated input-output coefficients and other parameters as would be needed to establish a working computer model, but does include the gathering of sufficient data to illustrate both the feasibility of, and the procedures involved in, the process of developing a working production-demand model.

The relative distributions of persons among the whole population in various kinds of jobs or businesses for the year 1970 are shown in Tables C-1, C-2, and C-3. (Table C-3 includes some facility usage information.) Multipliers as given in the tables are useful for making preliminary estimates of the number of persons with a particular skill that might be present in a given population group. Also obtained would be approximations of non-essential worker skills for a selected crisis relocation objective. Obtained from census data, such lists of per capita multipliers can be extended in both detail and scope. Types of other useful statistical data that are obtainable from the "Statistical Abstracts of the United States" are indicated in Table C-4 by table number and title.

Table C-1

Summary of Average Per Capita Multipliers
For Local Governmental Services[a]

Activity	(Persons/1000 People)
Education Administration	4.25
Teachers (Elementary and Secondary)	10.8
Police Protection	1.85
Fire Protection	0.953
Postal Service	3.50
Sewerage and Sanitation	0.861
Parks and Recreation	0.505
Libraries	0.170
Water Supply	0.482
Public Works (Engineers)	0.585

[a]Applicable to current practices (1970), U.S. average

Table C-2

Summary of Average Per Capita Multipliers
For Sales and Services Employees[a]

Activity	(Persons/1000 People)
Lumber, Building Materials, Hardware and Farm Equipment Stores	3.17
General Merchandise Stores	10.1
Food Stores	10.6
Automobile Dealers	5.84
Gasoline Service Stations	4.90
Apparel, Accessory Stores	4.81
Furniture, Home Furnishing Stores	2.87
Eating and Drinking Places	14.0
Drugstore, Proprietary Stores	2.72
Other Retail Stores	5.53
Non-Store Retailers	2.13
Wholesale Trade	18.9
Hotels, Motels, Tourist Courts	3.97
Personal Services	7.70
Miscellaneous Business Services	8.25
Automobile Repair Garages	2.46
Miscellaneous Repair Shops	1.61
Motion Picture Theaters	0.952
Amusement and Recreation Places	2.33
Medical and Health Services	16.0
Legal Services	1.91
Education Services	6.20
Insurance Salesmen	2.60
Real Estate Agents	1.36
Non-profit Organizations	7.10
Miscellaneous Professional Services	4.20
Private Household Services	6.00

[a] Applicable to current practices (1970), U.S. average

Table C-3

Average Values of Selected United States Medical Health Service Per Capita Multipliers

1. Medical and Hospital Capacities

Type of Profession Or Facility	Number Per Capita
Medical Doctors	1.60×10^{-3}
Doctors of Osteopathy	6.68×10^{-5}
Active Dentists	4.38×10^{-4}
Nurses	3.10×10^{-3}
Hospital Personnel	1.11×10^{-2}
Hospitals	3.40×10^{-5}
Hospital Beds	8.30×10^{-3}
Nursing and Personal Care Homes Personnel	1.28×10^{-3}
Nursing and Personal Care Homes	7.14×10^{-5}
Nursing and Personal Care Home Beds	2.89×10^{-3}
Extended Care Facilities	1.84×10^{-5}
Extended Care Facility Beds	1.32×10^{-2}
Psychiatric Hospitals	2.29×10^{-6}
Psychiatric Hospital Beds	3.12×10^{-3}
Skilled Nursing Homes	1.42×10^{-5}
Skilled Nursing Home Beds	1.07×10^{-3}
Home Health Agencies	8.81×10^{-6}

2. Medical Facility Usage

Type of Facility	Admissions capita-yr	Days Staytime Admission
Physician Office Units	4.2	---
Dentist Office Units	1.5	---
General Hospital	0.155	8.90
Mental Hospital	3.30×10^{-3}	325
Tuberculosis Hospital	1.00×10^{-4}	149
Nursing and Personal Care Homes	2.59×10^{-3}	
Extended Care Facilities	9.43×10^{-2} (b) (c)	

[a] Estimated for 1970 current practices

[b] Resident patients per capita

[c] Number of members per capita

Table C-4

Types of Information in the Bureau of Census Publication,
Statistical Abstract of the United States

Table Number	Title
572	Average Retail Price of Selected Foods
758	Manufacturing and Trade - Sales and Inventories
824	Electric Energy - Production, by Type of Prime Mover and Class of Ownership, States
830	Electric Utilities and Industrial Plants - Installed Generating Capacity, By Type of Prime Mover and Class of Ownership, States
832	Electric Energy Sales, by Class of Service, State
837	Gas Utility Industry - Customers, Sales, and Revenues, By Type of Gas, Class of Service, And States
873	Volume of Domestic Intercity Freight Traffic, By Type of Transport
874	Volume of Domestic Intercity Passenger Traffic, By Type of Transport
897	Cars and Trucks. In Use, By Age
898	Motor Fuel Consumption, By Use
912	Truck Carriers - Revenue And Expenses, By Type of Carrier
932	Scheduled Air Carriers - Summary Of Operations
964	Rural Population And Occupied Rural Housing Units, By Farm, Non-farm Residence - States
1010	Principal Crops - Acreage, Production, and Value (also, Tables 1013 to 1037)

The tabular contents of the Census of Manufacturers either by industry or area (state) are summarized in Table C-5. Actually, more real statistical data are available in the national industry series than in the area series where, because of confidential regulations, data are withheld. However, it is clear that data breakdown to individual industrial plants exists within the compilation of the original census information.

In illustration of the use of statistical data from the Census of Manufacturers to evaluate input-output parameters for the production-demand model, information from that publication on the clothing industry was collated and analyzed. The model descriptions are conveniently given in three tables of evaluated parameters. The first table summarizes general statistical relations for the industry. The second table summarizes the output statistics (average minimum demand) for the industry. The third table summarizes the input statistics (input-output coefficients) for the industry. All the data collated as part of the illustrated use of the referenced data source are given in Tables C-6, C-7, and C-8.

In Table C-6, the industry segregation is by the 4-digit SIC code. The number of establishments per capita is given to indicate the number of establishments relative to the number of people; if the number is relatively large, the industrial plants may be expected to be quite widely distributed; if the number is relatively low, it would be expected that the plants would be located in a few isolated locations. The latter case may thus be identified as a possible bottleneck problem for special consideration in operational defense plans, especially if the output product is a critical one. Otherwise, the data of column one of Table C-6 are not used in the production-demand model.

Table C-5

Tabular Contents of the Census of Manufacturers

(Industry Series or Area Series)

Table Number	Title
1A	General Statistics - Number of Establishments, Number of Employees, Number of Production Workers, Value Added, Cost Of Inputs, Value of Shipments, Value of End-Of-Year Inventories
1B	Selected Operating Ratios - from Data of Table 1A
2	General Statistics by Geographic Area
3	Detailed Statistics - Summary of Above
4	General Statistics by Employment Size of Establishment
5A	General Statistics for Establishments by Industry Specialization and Primary Class Specialization (to 5-digit code)
5B	Industry-Product Analysis (4-digit code)
5C	Industry-Product Analysis (5-digit code)
6A	Products & Product Classes - Quantity and Value of Shipments by All Producers (quantity of 5- and 7-digit codes)
6B	Product Classes - Value Shipped by All Manufacturing Establishments, by Geographic Area (Regional, State)
6C	Product Classes - Value Shipped by All Manufacturing Establishments (to 5-digit codes)
7A	Materials Consumed, by Kind (quantities and values; to 6-digit code)
7B	Fuels and Electric Energy Consumed (quantities and values; to 6-digit code)

Table C-6

Examples of General Statistical Relations For Clothing Industry

From The Census of Manufacturers[a]

SIC Number	Product Or Industry	Establishments capita	Employees capita	Workers Employers	Wages $/mh	Man Hours
2295	Coated Fabric Mills	0.970×10^{-6}	0.86×10^{-4}	0.732	3.87	2,145
2296	Tire Cord and Fabric Mills	0.086×10^{-6}	0.48×10^{-4}	0.910	3.12	2,130
2297	Nonwoven Fabric Mills	0.394×10^{-6}	0.50×10^{-4}	0.817	3.13	2,130
2298	Cordage and Twine Mills	0.749×10^{-6}	0.43×10^{-4}	0.844	2.69	2,000

[a]Data for year 1972

Table C-7

Sample of Output Statistics For Clothing Industry

From Census of Manufacturers

(Data for Year, 1972)

SIC Number	Output Product(s)	$\dot{C}_i$ or $\dot{O}_i$ (per capita-year	Percent of Total Output
2295---	Coated Fabric	2.04 lin. yard	100.0
2295100	Pyroxylin-coated Fabric	0.157 lin. yard	7.68
2295200	Vinyl-coated Fabric	1.06 lin. Yard	51.7
2295300	Other Coated Fabric	0.827 lin. yard	40.6
2296---	Tire Cord and Fabric	3.28 lin. yard	100.0
2296032	Rayon Cord and Fabric	0.469 lin. yard	14.3
2296035	Nylon Cord and Fabric	1.43 lin. yard	43.6
2296037	Polyester Cord and Fabric	1.08 lin. yard	32.9
2296039	Chafer, etc.	0.301 lin. yard	9.18

Table C-8

Sample of Input Statistics For Clothing Industry

From Census of Manufacturers

(Data for Year, 1972)

SIC Number		a_{ikp}
	16. Output 2295 - Coated Fabric Mills	
--	Direct Labor	0.0662 mh/lin yd
960012	Electricity	6.83 kwh/lin yd
131300	Natural Gas	8.01 kwh/lin yd
291100	Fuel Oil	8.67×10^{-4} bbl/lin yd
121005	Coal	----
--	Water	----
282137	Vinyl and Vinyl Resin	0.779 lb/lin yd
220234	Cotton Fabric	0.949 lin yd/lin yd
220241	Manmade Fiber Fabric	0.241 lin yd/lin yd
970099	Other Materials, Containers, & Supplies	0.387 $/lin yd
976000	Same as Above, n.s.k.	0.062 $/lin yd
	17. Output 2296 - Tire Cord & Fabric Mills	
--	Direct Labor	0.0284 mh/lin yd
960012	Electricity	2.05 kwh/lin yd
131300	Natural Gas	2.64 cuft/lin yd
291100	Fuel Oil	9.95×10^{-6} lin/yd
121005	Coal	8.64×10^{-6} s.ton/lin yd
--	Water	----
013101	Raw Cotton	1.21×10^{-4} bale/lb
282301	Rayon and Acetate Yarn	0.0728 lb/lb
282423	Polyester Yarn	0.316 lb/lb
282402	Manmade Yarn, excluding glass	0.510 lb/lb
322935	Glass Yarn	0.0505 lb/lb
97099	Other Materials, Containers, and Supplies	0.0668 $/lb.

The number of employees per capita in Table C-6 indicates the average concentration of persons with combined skills applicable to the industry; this ratio would certainly vary from one region to another depending on the areal variation in concentration of the particular industry. The averages provided may be useful for estimating numbers of persons among the overall population of persons with different skills or of persons likely to be associated with a specific industrial group, given the number of people to be hosted in a certain area. The ratio of the number of workers to employees may be used to estimate number of essential workers for an industry, once the number of establishments to be kept operable is determined for a given crisis relocation objective. The wage rate provides a means for estimating the costs of maintaining operability, once the number of essential workers is determined; it may also be used to estimate costs of the evacuation where the policy is to pay workers during relocation on the same basis as if they were working normal shifts. The number of man-hours per worker per year gives only an indication of whether the industry provides seasonal or irregular work hours; normally, for a 40-hour week, the ratio would be 2,080 man-hours per worker per year. Averages less than 2,080 would indicate either inefficient use of available capacity or seasonal operations; averages higher than 2,080 would indicate significant overtime employment and the near-capacity use of facilities.

The output statistics, as provided in Table C-7, include output products generally to details of the 7-digit SIC code. The output, or maximum consumption, rates (see conditions for Equations 8 and 9, Appendix B) are expressed in terms of a quantity produced (or consumed) per capita per

year. Hence, if the crisis relocation policy objectives were to supply the population at normal 1972 levels, the values of $\dot{C}_i$ of Table C-7 would be used in Equation 9 (via $N_r \dot{C}_i = \dot{D}_i$) to estimate the required inputs for product i.

In the case of the clothing industry, it is clear that many mill facilities have the capability and flexibility to produce a variety of products; hence ,the 4-digit code designates a broad category of goods and items rather than a single main product with a few minor by-products. Thus , these types of facilities could, more readily than many others, respond to the production of one or two needed items in quantities that might differ a great deal from the usual distributions such as those of Table C-7.

The input statistics, as given in Table C-8, are expressed in terms of the previously defined input-output coefficients. The inputs are generally provided to details of the 6-digit SIC code. The evaluated coefficients are statistical in nature since their values relate to the output distributions of Table C-7 for each type of establishment described by a 4-digit SIC code. In the tabulation, the energy inputs are listed first and then the material inputs.

The above discussion indicates that a fairly comprehensive production-demand input-output model can be formulated with use of the census data. Its restrictions, as in the case of the illustration (i.e., the clothing industry), is that the evaluated input-output coefficients are based on

statistics representing a certain distribution of outputs and that they represent an average performance of all operating establishments within the nation or region rather than performance for a particular process or establishment. With some additional information and data, however, a model based on the statistics should provide a reasonable first estimate of inputs and establishments and production rates needed to satisfy a stated demand rate of an essential item. This estimate then could be adjusted by regional planners in cooperation with likely local producers and their suppliers.

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ECONOMIC AND INDUSTRIAL ASPECTS OF CRISIS RELOCATION: AN OVERVIEW
Center for Planning and Research, Inc., Palo Alto, CA May 1977 174 pp. Contract No. DCPA01-75-C-0279
Work Unit 2313E

UNCLASSIFIED

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